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VOLUME 3<sup>1</sup>, 1919  
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PHILADELPHIA AND LONDON

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PUBLISHED BI-MONTHLY (SIX NUMBERS A YEAR) BY W. B. SAUNDERS COMPANY, WEST WASHINGTON  
SQUARE, PHILADELPHIA  
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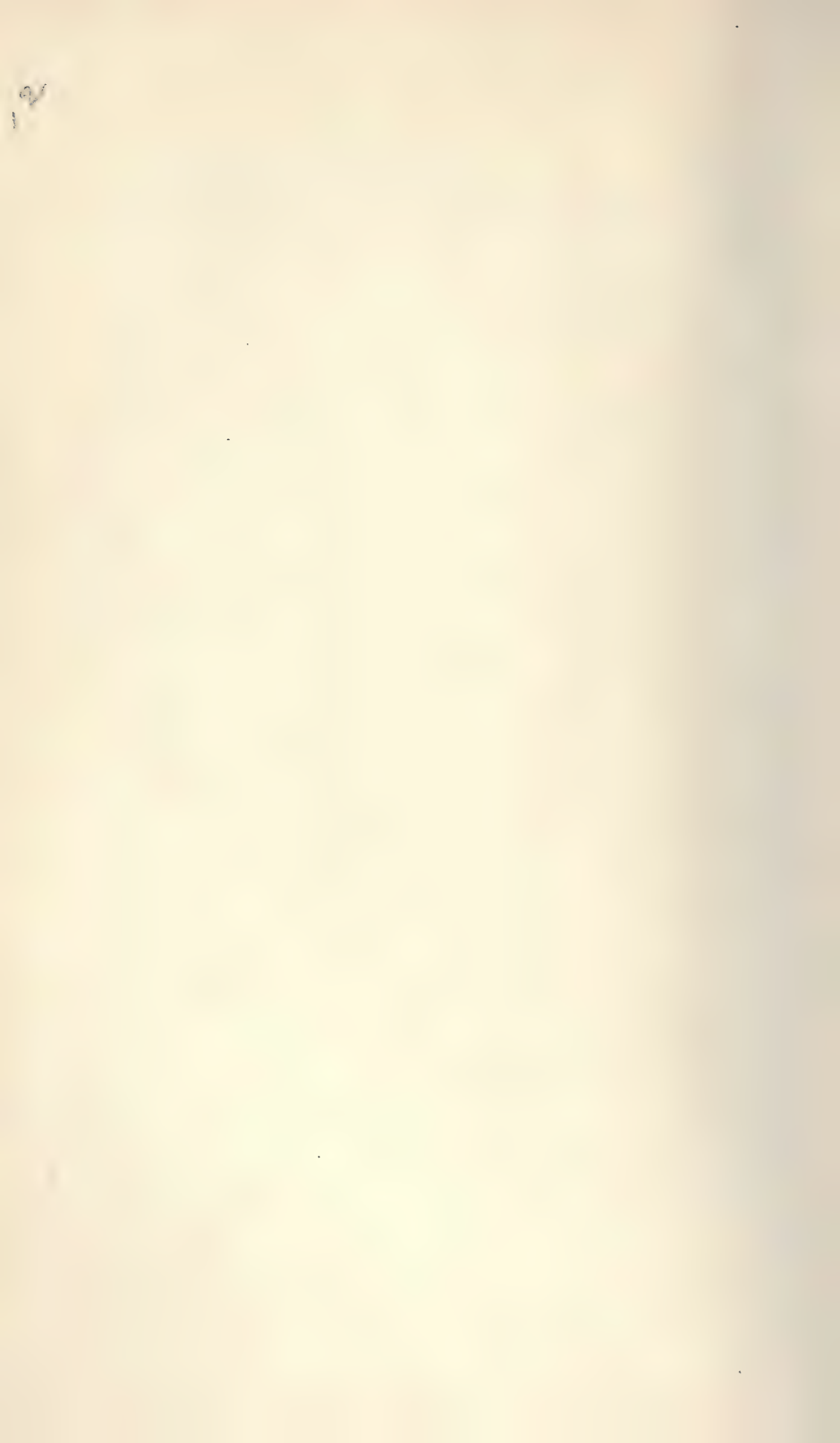
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# SURGICAL CLINICS OF CHICAGO

Volume 3

Number 1

CONTRIBUTION BY MAJOR KELLOGG SPEED, M. C.,  
U. S. A.

## SURGICAL CASES AT AN A. E. F. EVACUATION HOSPITAL

*Summary:* General remarks—work of the American surgeon in France—general types of wounds and indications for operation—watchfulness of non-operated bullet wounds—splinting and dressings—the night's work in its general run.

Case I.—Technic of operation; use of *x-ray*; Carrel-Dakin treatment; little points about knee-joint; additional notes on case. Septic knee-joints—the latest treatment—drainage plus motion; no splinting; team records.

Case II.—Description of wound with physical examination; remarks on nerve and spine lesions; treatment—contra-indications for operation; value of commencing orthopedic care early; progress of case.

Case III.—Description—blood-vessel injury; course to be pursued; indication for operation; amputation of leg—technic—the circular flap—bone sawing; pathology; treatment of severed nerve sheath; remarks about excision of head of fibula; false aneurysm—ligation of popliteal artery; dressing amputation stump.

Case IV.—Description; pathology—severed brachial artery; necessity for careful pre-anesthetic examination; severed median nerve; peripheral nerve repair; clinical course of suspected nerve lesions; rules for nerve injuries about elbow; technic of nerve suture—use of a fat flap as a covering for the sutured nerve; additional notes.

Case V.—Use of De Page anesthesia—formula.

THE status of the surgical work at our Evacuation Hospitals is one of keen interest to us at this time, affecting some of us personally on account of our wounded friends and relatives, and because we, as Americans, are interested in a comparison of our own medical services with those of the Allied forces. Are American surgeons making good in this new aspect of their professional work, are they profiting by the surgical lessons learned by the other armies, and are they showing the result of their excellent training in the army work before they reached France? In our national pride we feel that a group of average medical officers, selected from the thousands in the service, can give as good an

account of themselves in either an administrative or professional way as a similar group from any army. Consideration of the length of lines of communications and their incidental difficulties, together with the local problems to be solved in all new temporary hospitals, will not alter our hopes in these men to make good, and the results already obtained may be said to be above expectations.

Most of the actual advance area surgery is performed by casual surgical teams, composed of three officers, an operator, an assistant, and an anesthetist, a nurse, and an orderly of the medical corps. Any number of teams can be used at a given point, depending on the battle and the number of wounded requiring attention. In the operating tents and rooms we must know something of the conditions arising in front of us, and from the character of the wounds the men present we are able to satisfy our thirst for direct information as to the nature of the fighting. When shrapnel wounds predominate, as they do in trench fighting and preliminary bombardments, we know that the wounded are fairly limited in number, because men have cover. As we chase the Boche, however, and bullet wounds rise sharply in proportion to the whole, we know the enemy resistance is failing, he is depending on rifle and machine-gun fire, and that the continuation of the drive, with its wounded stream to the rear, promises to be prolonged. The technical surgical work also varies with the battle in accordance with this proportion of shrapnel and bullet wounds. In heavy artillery fire and stationary warfare the dirty ragged wounds of shrapnel and high explosives necessitate early and careful removal of foreign bodies, incarried cloth and metal, and the minute debridement of damaged tissues. Thus, not only is early healing obtained and later suppuration avoided, but the dreaded gas and other anaërobic infections are reduced to an amazingly small percentage. On the other hand, when through-and-through bullet wounds, received at close range and from missiles of high velocity, are in the majority, the surgeon's work is considerably lessened in its minute technic. Foreign bodies are not present in the tissues, the wounds are small and quickly heal over, and the



danger of infection of all character is lessened. Even with comminuted fractures of long bones there is slight indication for operation—injuries to important nerve trunks and blood-vessels or joint cavities offer the main exceptions. In bullet wounds we must avoid a tendency toward overoperating—conservatism and non-interference are the best policies. These wounds must be particularly watched, nevertheless, for the development of gas infection, *because they have not been opened and excised thoroughly, and there has been no surgical check instituted against those infections.*

One must revive all one's ideas of splinting, which, at least as far as metal splints are concerned, has become almost a lost art with us in the States. We have used plaster of Paris so extensively and successfully in civil practice that we have lost sight of the advantages of iron, wooden, and wire splints. They are needed for these injuries, although fracture may not be present, which require immobilization, to give rest to parts, and to offer support in the necessary jostle of transportation. Perhaps no phase of the work is more important than the use of splints. We can learn much from our orthopedic brothers and from the experiences of the British with their wonderful outfits for splinting wounds. The medical dressing officer in wards at the hospitals must learn to respect splints. No operator employs one unless it is indicated, and, as a rule, his pride will not permit him to have one leave his tables until it is satisfactorily applied. Too frequently a medical officer, subsequently attending the patient, is inclined to remove the whole splint for his dressing purpose, and not having much assistance nor the aid of anesthesia, the reapplication of the splint may be inadequately performed, to the patient's discomfort and the detriment of wound healing. It takes the ordinary officer but a short time to learn that he can do his dressings much quicker and with less hardship to the patient and to himself if the splint is left on. It is also true that many nurses become as expert at dressings as officers, and while the officers must see the patient's wounds and advise frequently on the course of dressing, it often is impossible for them to perform more than a small percentage

of the actual work. The officer's time is better used in adjusting and inspecting splints and directing his ward service after attention to his records. If nurses are employed for dressing purposes, their technic must be constantly checked over, and the possibility of contamination from patient to patient absolutely avoided. Rubber gloves worn by dressers, washed in an antiseptic solution between each service, together with the use of boiled instruments, alone will obviate the scattering of infection. A rigid routine must prevail.

Let us take the first few patients in order tonight as we go along to get an idea of the work and of the extent of the field in which the operator must be prepared to functionate.

CASE I.—C. J., — Infantry. His field card tells us that he was injured exactly forty-two hours ago. As the orderly takes off the bandages we find these wounds:

1. Gunshot wound of the right scapular region, penetrating, with fracture of the right scapula.

2. Gunshot wound of the left knee, penetrating, inner aspect, Because of the number of wounded every one cannot be  $x$ -rayed, and as these wounds are serious, and the patient's condition is none too good, we must clean the wounds and attempt to find the foreign bodies without the help of a localization. That is not such a difficult task in some instances by following the wound tract. In others, like the patient I was asked to see on my way to the tent, it would be rather difficult to find the metal without an  $x$ -ray screening. That man had been hit in the right shoulder, and the missile, a bullet, lay just below Scarpa's triangle in the left thigh, having traversed both chest and abdominal areas.

We shall start on the scapular wound first. It is very dirty and there are soiled ragged edges with inborne dirt and grass, sufficient evidence that the cause was a piece of shell. A very narrow soiled skin edge is removed from the transverse entrance wound, and then the skin across the back must be laid open to follow the missile's track. The right scapula is fractured below the spine into the body of the bone, and as I follow the path toward the left side I find a hole punched in the left scapula, and the piece of metal lying in the muscular tissue behind the left

shoulder, showing that it has traversed clear across the back, slightly damaging the spine of the fifth dorsal vertebra. But to expose this soiled track and to excise its dirty tissues requires an enormous wound, and the shock to the patient is, to an extent, proportionate to the length of skin opening, the amount of blood lost, and the duration of the anesthesia.

We have removed the foreign body, stopped the hemorrhage after debridement, and now lay in the wound a single spread-out layer of coarse-meshed gauze. On top of this, projecting from the ends of the dressings, I will place Carrel tubes, eleven in all. The irrigation of the Dakin's solution through them must not be started at once, because we have a very large surface here which wishes to bleed, and a wet dressing would increase and prolong the slight oozing by capillary action. Hence, we put on dry dressing and begin the introduction of the Dakin's solution tomorrow morning. On the table here we have effected a mechanical sterilization of the wound by cutting away all the soiled tissues. Tomorrow, when the irrigation is started, a follow-up chemical sterilization will be inaugurated.

As the patient has now been turned over on his back and his foot is held up in the loop swing, the orderly quickly shaves the thigh and knee, and the skin preparation is finished. Again this ragged wound on the upper and inner aspect of the thigh above the knee is carefully debrided by cutting away soiled tissue. As I progress every care is taken to avoid the thin wall of the subcrureal pouch of the knee-joint which must lie extremely close to the depth of the laceration. Following the wound down on the inner aspect of the knee I find that it leads to the tibia, which is here exposed, and sticking rather deeply in the inner tuberosity of the tibia is the piece of metal. I dig it out and cleanse the wound, and still I am unable to see or discover an opening into the synovial covering of the knee-joint. It is possible, if the knee-joint were distended, to exert pressure on it, and if even a small exit existed from the joint cavity, the fluid within, under pressure, would be forced out to aid the surgeon to locate the hole. This joint is not so distended, but it might be distended by the introduction of normal salt solution



and the expression method attempted. I am unwilling, however, to attempt that under the conditions in which our surgery is performed.

The wound is left wide open. No Carrel tubes are inserted in it because it drains perfectly, and if infection arises in it, let us hope that it will seek the easiest path out through the open cutaneous wound and not into the joint. A Thomas splint is applied, and the knee is kept at rest to favor drainage and absence of motion which might suck infection into the joint through an undiscovered hole.

The prognosis for these extra-articular wounds is good. The patient should recover without a pyarthrosis, much depending on the presence of a minute opening into the joint.

*Additional Notes.*—For three days the patient did fairly well in spite of his enormous back wound and chest contusion. On the fourth day his knee became slightly swollen. That night it was aspirated on the uninjured side, and the fluid obtained was cultured. Streptococcus was found, and on the fifth day the joint was widely opened by lateral incisions for the extent of the joint and its subcrural pouch. The Thomas splint was removed and the man was encouraged to move his leg to force the pus out of the joint by its own motion. At first this was painful, but after a couple of days he could flex the thigh almost to a right angle unaided. All dressings were left off, and the knee lay on a large sterile pad into which the pus ran. A cradle held off the bedding. He was encouraged to move the knee, and twice a day it was passively flexed by the ward medical officer. The motion is depended upon to force the pus out of the openings, and to provide complete drainage until the individual's resistance overcomes the infection and the suppuration ceases.

For a while his condition improved, his temperature dropped, but his scapular wound did not do very well. A severe septic downward course supervened, and on the twenty-seventh day death followed.

No autopsy was possible, as we left the station that day, and there were no facilities for any examination.

I had desired to follow a series of frankly septic knee-joints treated by lateral opening and movement, but my recent work has been in front line surgery away from sepsis, and the opportunity has not presented itself. This method of full open drainage has long been in vogue. The addition of movement is newer. I treated many septic knees while in service with the British Expeditionary Forces in 1916, but, for the most part, they were immobilized or irrigated by different antiseptics. At this time in the frank pyarthritides we are using drainage plus motion, and, on the whole, the results are going to be better. Reports on a series of these infections will be forthcoming soon.

While the orderlies were putting the dressings and splint on the patient the anesthetist has already passed along to the next table where another wounded man awaits attention. We keep our own team records entirely separate from the hospital records for the information of the team head in cases of referred inquiry and interest, and as a protection against errors by others in the hospital. With so many teams at work it is wise to adopt this method. It also gives one the figures for compilation of a statistical monthly report to the chief surgeon, in which it can be shown what the team has done, what classes of patients it has handled, and what the immediate results have been.

CASE II.—This next man is Corporal G. A. G., — Infantry, injured just nineteen hours ago. The lieutenant always seeks my approval before starting the anesthetic unless there is an extremely evident indication for operation. Upon examination of the corporal I find that he has sustained a gunshot wound of the left side of the neck from a machine-gun bullet. The missile has passed clear through, the entrance wound is located just in front of the anterior border of the sternocleidomastoid muscle about halfway down its length, and the exit is here almost directly over the seventh cervical vertebral spine. Observe how rigidly he holds his head, and how he complains when any movement of his body which affects his neck or trunk is performed. He complains of severe radiating pains about his left shoulder and down his arm, and claims he cannot move his left arm. To a slightly lesser degree there are similar sensations of pain and

loss of power in the right shoulder and arm. By going deeper into the examination I find that the condition in the right arm is that of a partial paresis, the muscle movements are slow and painful, and yet they are actively possible. In the left arm, however, the side of the injury, the paralysis seems at first complete. After encouragement and many attempts I can elicit slight pronation and supination of the forearm, and some power in the triceps, deltoid, and trapezius. The hand, nevertheless, lies inert and powerless.

From this weakness, combined with pain, we can conclude at once that there has been at least a contusion of the nerves of the left cervical plexus—there may be severance, or there may be a contusion of the whole spine, involving a level from the third cervical down to the first two dorsal, because we find the pain and weakness present on *both* sides—a hematomyelia may be present and spreading. We have no advantage in the help of a Roentgen plate here. It is a through-and-through wound and the missile undoubtedly has passed out. In this advanced and rapid life-saving surgery we are in luck to have foreign body localizations. In a short time we can anticipate that our army Roentgen department will furnish us with those admirable celluloid plates which are light and non-breakable and can be transported with the patient. In a selection of patients for Roentgen examination this man, possessing a too evident through-and-through wound, is weeded out and sent direct to a surgical table for attention. Consequently, we have only clinical findings to aid us in a diagnosis of fracture of the bony spine and injury of its precious nerve content. The physical findings then must be rapidly obtained and our conclusion must be based on them because there are many other wounded waiting.

The deep tendon reflexes are quite normal, his knee-jerks are very brisk, but may be normal for him. The cremasteric and abdominal reflexes are sluggish. When I palpate the cervical region carefully I fail to find loosened bone or crepitus, but on deeper manipulation the pain in the shoulders becomes severe. Accepting these findings and adding 1 per cent. experience to the 99 per cent. of evidence from the examinations, I feel justified



in diagnosing probable fracture of the bony spine—at least of a transverse process of a vertebra, about the fifth or sixth cervical—contusion of the spinal cord, with some hemorrhage into the anterior horns and possibly destruction of some of the cells.

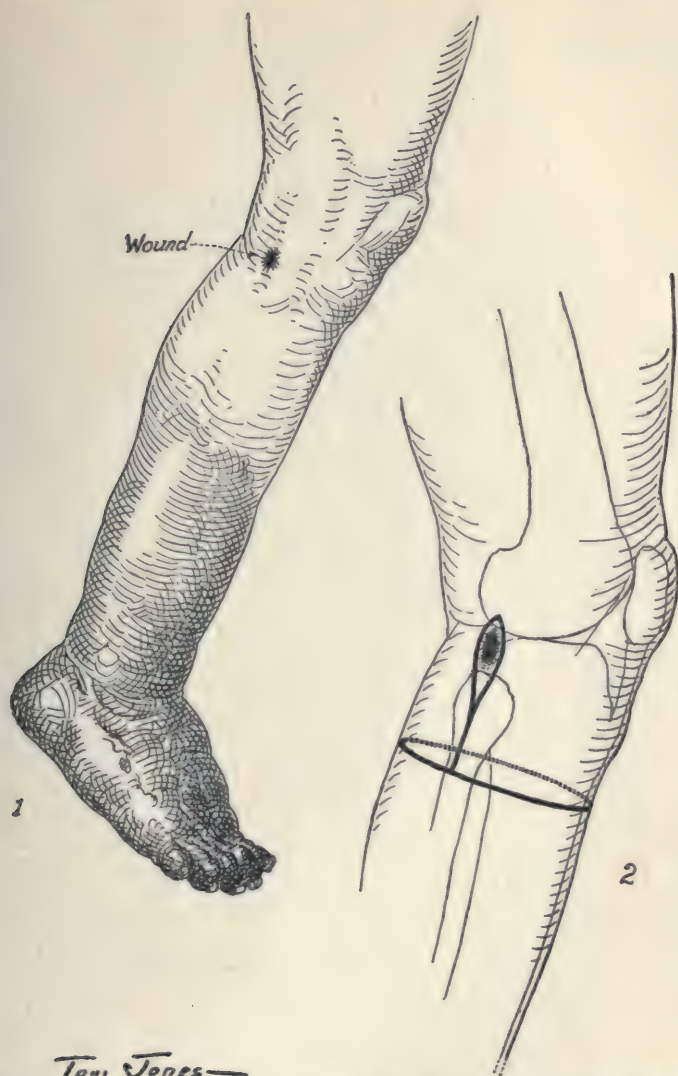
What shall my treatment be? First, shall I operate on him?—what for? If I fear sepsis I might debride the track of the missile. Recall the path of this bullet, and answer the question for me—can I quickly, completely, and successfully debride a narrow track which must pass within a fraction of an inch of the great vessels and nerves of the neck and involves the spine behind? It is not necessary, nor is it anatomically advisable—I have tried to do it. We know that these through-and-through bullet wounds will care for themselves in a large percentage of their occurrence. Therefore I shall not operate, but I will make the diagnosis I have mentioned, and I will offer him treatment. That shall consist of three parts: first, a simple sterile pansement over each wound; second, an attempt must be made to hold his head still, to prevent any displacement of the spine if he should cough, sneeze, or move his head suddenly; third, to prevent further hemorrhage following even simple head motion with more pressure on the cord, and to decrease his pain by establishing a rigid neck. This position can be assured by a jury mast to hold his head in harness by suspension of a small weight over the head of his bed. But advanced military hospitals do not carry this leather harness, and one of our purposes is to prepare the man for transfer to the base as quickly as possible. We do have cardboard, however—bandages come in cardboard boxes—and we will fashion a Thomas collar out of several layers of cardboard, extending the head slightly and bandaging it in a stiffened position, so as to hold it perfectly erect. The third field of treatment carries us to his left forearm and hand. That hand should be placed in extension, the wrist held on a cock-up Jones' iron splint to avoid a tendency for the stronger flexors to overcome the extensors and prolong a drop wrist. By beginning his orthopedic treatment here, nineteen hours after injury, we may save him tedious months of massage and exercise to obtain a muscle balance. If I were positive the

radial nerve above were severed, the operation of tendon transplantation for drop wrist, which I described in the Clinics<sup>1</sup> last year, might be done right here. I have no such positive assurance, but I will take the precaution of using this splint.

*Additional Notes.*—The patient was seen the next afternoon. He had much less pain and was grateful for the steadiness of his head; left arm motion about the same; right arm a little increased. He made steady progress, his wounds remained clean, and slowly the use of the muscles in his left forearm and hand returned. He was kept under observation nine days. Before that time the splint had been removed and twice a day massage was given the left arm, and he was encouraged to use it constantly. When he left for the base the wounds were clean and healed, but he still wore the Thomas collar. (See Case IV.)

CASE III.—The next patient has been here before. He is Private V. McC. of the — Infantry, received on this table twenty-four hours after injury—that was three days ago. There was a through-and-through wound just below the lower border of the popliteal space of the right leg (Fig. 1, 1). We diagnosed a bullet wound from its aspects. The leg was hard, cold, and no pulsation could be felt in any of the ankle or foot arteries. Sensation was also lacking in the foot, but there was no gangrenous discoloration, and as he was very tired we took a chance on not operating after diagnosing injury of the popliteal artery, probably complete severance. The foot and leg were carefully wrapped in thick cotton well above the knee, and then suspended with the foot supported at a right angle in a Thomas splint, the toes being left out for observation purposes. The next night his toes presented a slight capillary circulation and, although the foot was still cold and there was lack of sensation, we did not unwrap the leg, preferring to give it more time before disturbing it. On the second night the foot was cold and blue halfway up the leg and there was absence of pulse and sensation. Tonight, just before coming over, I saw him and decided on amputation as high as we can perform it *below the knee-joint*. The small bullet wounds are fairly clean and my desire in this early ampu-

<sup>1</sup> Surgical Clinics of Chicago, Vol. I, No. 1, p. 187.



*Ton. Jones—*

Fig. 1.—1. Point of entry of bullet. Note that the lower two-thirds of the leg is gangrenous and much swollen. 2. Circular incision for amputation of leg. Note the extension of incision upward so as to encircle the wound. This was made for the purpose of facilitating the dissection.

tation is to save the knee-joint by operating in a manner to drain the wound track and yet to utilize the still viable skin of the leg.



After a delay should sepsis supervene in the leg or the wound, nothing but thigh amputation will suffice, and even then we could anticipate a septic stump with a long illness. Early amputation is frequently the best course in war wounds of known blood-vessel pathology when imminent gangrene threatens. Gas infections with a rapid spread are the bugbear. (See article by Speed on Amputations, Jour. Amer. Med. Assoc., July 27, 1918.)

A constrictor has been placed on the thigh. Our skin-flaps are not square nor racquet shaped, but one incision is made and that is circular, completely around the leg at this level, just above the darkened area, which indicates the arrested circulation (Fig. 1, 2). The skin and superficial fat are dissected back rapidly. A point is soon reached where the flap refuses to fold back further; that is obviated by a lateral incision parallel to the long axis of the leg over the fibula; I usually make it immediately after the circular cut. That permits the flap of skin to be turned back cuff-like as far as one wishes. Both bones are sawn off, the fibula first, slightly higher than the tibia and bevelled in and downward. You observe that I reverse the saw and use the cutting edge upward. That saves me from crouching down on the floor beside the patient and accomplishes the same purpose as if I had turned the patient over on his face and flexed the leg on the thigh—the very best position of all to use in these leg amputations. The tibia is severed by first bevelling the sharp anterior edge by an oblique cut just below the tibial tubercle to save the insertion of the patellar tendon, and to avoid the knee-joint. There remains then only skin, the two bones, and the stumps of the gastrocnemii, with the blood-vessels tucked in between and behind. Here I find two quite large vessels. Evidently I am just below the bifurcation of the popliteal, but apparently above the wound track. The portion of the vessel severed by the missile is probably in the removed leg, and we can examine it after the operation is finished. These vessels are tied and the nerve is shortened until it draws back well covered. I frequently close the nerve sheath after its shortening when dealing with the sciatic and other large nerve trunks to protect the end of the axis-cylinders from cicatrization and from

infection arising in the stump. That can be accomplished by a stitch or two of catgut. It has been suggested that the end of the nerve need not be cut off short; that it can be ligated above the severed end by a series of mattress stitches, which result in the death of the distal portion of the stump. My idea has always been to avoid the conveyance of centripetal impulses over the large nerve trunks in amputation—to handle them gently and to cut them quickly. On the operating-table I have several times had the anesthetist keep a record of the blood-pressure clear through the operation. Severance of the soft parts is not a large factor in lowering this pressure, but invariably after a nerve severance the pressure tumbles abruptly. Consequently, my respect for the nerves and a failure to take up ligation of them in their continuity. As the nerve proper retracts, however, it seems an excellent step to close a large open sheath distal to the nerve and without compressing it. That is sometimes necessary to control hemorrhage from the vessels in the sheath. It should be used whenever subsequent sepsis is feared.

May I say a word here also about excision of the head of the fibula in the amputations just below the knee. This is performed on theoretic grounds to give a stump of one solid bone, the tibia, and also to avoid pressure on the outstanding peroneal nerve in its course around the fibular head from the boot of the artificial leg. You note I said theoretic—it seems to be largely theory. In practice what happens, especially in war amputations where the risk of sepsis in stumps is nearly unavoidable? In removing the fibular head a small connection to the knee-joint may be caused when ligaments are detached, or a small natural connection may lie patent. The sepsis in the short leg stump easily finds a path thereby to the knee-joint, and an infected knee results. I have seen several instances of this course of events—one resulting in death, others in secondary thigh amputation, and now I never remove the head of the fibula.

We cannot close this stump. First of all, it is against orders. Remember, we are doing military surgery, and some general rules must be made by those in authority for the welfare of the greatest number of injured, and second, because we are not quite

sure of the blood-supply of these skin-flaps. There remains only the constrictor to be removed.

When that is done you notice the enormous stream of blood that spurted out on me, and immediately the constriction is tightened again. What is the trouble? Did we fail to ligate the arteries, or did the ligature slip? Not at all. We are dealing with a false aneurysm of the lower end of the popliteal artery, the result of gunshot (Figs. 2, 3). It has retracted up into the fatty tissue, about the vessels, and the ligatures I applied are below it. The incision through the muscle belly cuts through

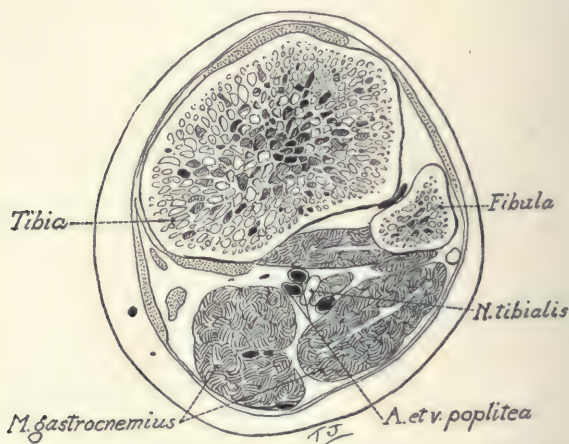


Fig. 2.—Cross-section of the leg slightly above point of amputation, showing the relation of the tibia and fibula and location of vessels and nerves.

the false wall and the blood-stream shot out as from an open artery. I know that is so because I have seen many of them, and here is the sac of the false aneurysm, just as I explained. Our stump is very short below the knee-joint. If I go higher to dissect around this aneurysmal area I shall endanger opening the knee-joint behind—so I shall adopt a simpler method. The patient must be turned on his face. Through a  $2\frac{1}{2}$ -inch incision in the popliteal space I quickly pick up the popliteal artery and ligate it, closing the operative wound with S. W. G. The vein is tied below and is uninjured. If my pathologic reasoning is sound, there will now be no bleeding when the constrictor is



removed. You see the stump simply oozes a little, a fact we are glad to see, because it prophesies that our skin-flaps are viable. The slit side of the skin-flap and the extreme corners of it on each side I will tack together with a silkworm-gut, leaving the center wide open, *not* packed with gauze, because that will cause him great pain to remove and may demand another anesthesia. A stitch or two in the flap corners will not interfere with drainage, and it saves us much damning from the medical

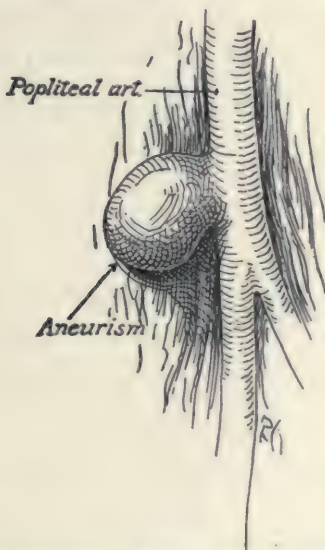


Fig. 3.—Sketch of the aneurysm of the popliteal artery caused by a severance of the artery just above its point of division. The sac was the size of the end of a small thumb. The pressure of the blood in it had helped to cut off the circulation in the leg.

officer at the base who has to close this or watch it close, and who cannot saw off more bone unless he reamputates above the knee. We have done so much base work that we know these points are intensely live ones and save much pain and distress to the patient, and criticism of the distant helpless operator.

CASE IV.—While the orderlies are finishing the dressing our next patient asks for a drink. He has been waiting a few minutes because we are a little slow tonight—it is cold and rainy, and we do not seem to get steam up properly. He is A. T., Private, —

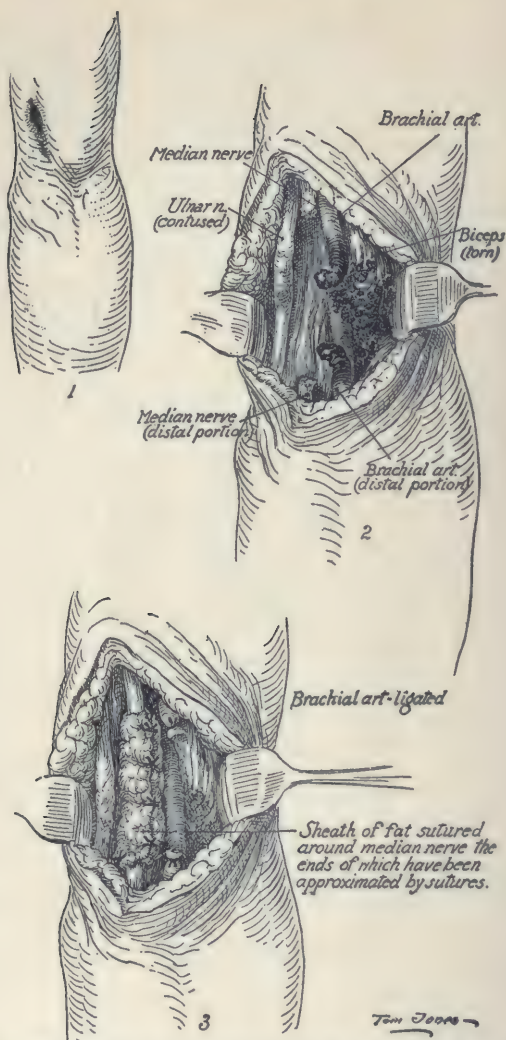


Fig. 4.—1. Wound just above elbow-joint on anterior surface of the left arm. 2. Extent of damage caused by missile. Note blackened and curled-up ends of severed brachial artery. The median nerve has also been severed and the ends retracted nearly 3 inches. The ulnar nerve is somewhat contused, but otherwise undamaged. The biceps is somewhat mutilated. 3. The median nerve has been carefully joined by fine sutures, and a pad of fat taken from the thigh has been placed around this wound, the edges overlapped and sutures together. Two stitches are then placed in its sheath, anchoring it to the tissues in order to prevent slipping. The brachial artery has been ligated just above the damaged and curled-up ends, and its damaged portion then excised. The ragged ends of the torn biceps have been clipped away.

Infantry, injured thirteen and one-half hours ago by a piece of shrapnel just above the left elbow. The wound is here on the inner anterior aspect of the arm, and is not so very large, but is ragged and progresses distally in a superficial way. Before I decide on putting him to sleep—you see the anesthetist shakes his head, thinking I will not need to—the arm and hand must be examined. The anesthetist has already been palpating this I know, and as I do also it is evident why he considered general anesthesia unnecessary. Above the elbow and apparently slightly below the skin a metallic foreign body can be felt (Fig. 4, 1). By lifting gently the corner of the lower flap I see the dark metal, and with a hemostat, after a little manipulation of this puckered skin opening, I can get hold of the missile. It is large. By some traction after several attempts it comes out. It is nearly 2 inches square—a very large piece—and you observe what a profuse hemorrhage follows its removal.

We will slip on a constrictor and anesthetize him. If the wound were superficial it might be possible to inject novocain solution,  $\frac{1}{2}$  per cent., and do a debridement. When this skin is slit open and the cut-away wound opening is enlarged, down in front of the elbow we find the large soiled bed in which the foreign body lay. The early and unexpected onset of the hemorrhage prevented me from making examination of his hand to find out whether the nerves supplying the forearm and hand were intact. As I trim away this tousled biceps muscle I come to the severed end of the brachial artery. You can see how the darkened ragged ends have curled up and inward, the distal end the same as the proximal, and hemorrhage has been stopped, helped perhaps by the presence of the foreign body, but also by the rolling of the intima (Fig. 4, 2). As I ligate each end of this artery I go high enough on both parts to get above the damaged portions, and in the ends removed are the clots which have plugged them. I must debride the damaged arterial ends just as much as I do damaged muscle, because that tissue left behind might be the origin of sepsis. Further down, toward the internal epicondyle of the humerus, the ulnar nerve has been contused and damaged. The sheath shows some swelling



and hemorrhagic extravasation, but nowhere does it seem to be punctured. Consequently, I leave it alone. As I clean up this wound further I fail to find the median nerve which passes across the antecubital area. Here it is—or at least its proximal end—because it has been completely severed. This is a warning instruction—that the innervation of an extremity must be particularly inquired into before the patient is put to sleep no matter what portion of it is wounded. The only excuse in this instance was the hemorrhage, which necessitated the application of the constrictor, and our effort to hasten the anesthesia. The distal end has retracted well down here in the front of the elbow, so that the skin must be further incised. There are the two nerve ends, separated now nearly 3 inches. Before proceeding further the depth of this wound must be carefully debrided. There is no evidence that the elbow-joint has been opened.

Can this hiatus in the nerve be bridged, or must the wound be left thus, with loss of nerve substance for fear of sepsis if I attempt some operation of nerve splicing? Should the nerve be cut longitudinally, and a piece turned down to fit in this space, or should I, if it were physically possible, make traction on the two ends, and attempt to suture them together? In the first place it is fairly well demonstrated both by the physiologist and clinician that many late sutures of peripheral nerves are a failure. Consequently, when a nerve severance is expected, or the findings are suspicious, the suture should be done at once. May I say to you, however, that in many fresh wounds, especially bullet wounds which give a finding suspicious of serious nerve damages or severance, the physical findings of early examinations are often misleading. In my experience about 90 per cent. of these suspected nerve lesions are simply contusions with suspension of function, and when the wound is examined the nerve is intact. When these patients are watched, within a few days to two weeks full function returns in the muscles supplied by the nerve in that large percentage. That should aid us a little in deciding for or against immediate operation when the path of the missile has been in an unfavorable anatomic situation, such as deep in the neck at the origin of the cervical plexus,

especially when the wound is a clean through-and-through bullet wound and there is little general indication for operation. Then we should carefully consider this point, and many times wait a few days at least before deciding that a whole plexus, or any given large nerve trunk, has been severed. That is an important practical point in war surgery.

To return to this specific patient—to my mind, nerve splitting and flap repairing are of no value—so I will not split the proximal end and turn down a half of the nerve trunk to meet the distal end. It is not possible to pull on these two ends and approximate them, as you see. What shall I do? The answer is simple. I will flex the forearm to a right angle at least, and the two ends lie in easy apposition. Another point should be fixed in your mind. In the arm, and about the elbow, loss of continuity in the median and ulnar nerves is not difficult to overcome, simply by flexing the elbow, or by bringing the ulnar forward across the antecubital space, out of its bony channel about the humeral condyle. Injuries of the radial (musculospiral) are not so easily handled, especially when they are on the back of the arm and involve the nerve in its course around the humerus. There the nerve cannot be released by arm posture.

The nerve ends are now found, cut off cleanly, and approximated, the wound has been mechanically cleansed, and now I must suture the nerve. Mattress stitches are introduced on at least three sides of the circumference of the nerve sheath, *through the sheath only*, with the finest silk we have, and when all are tightened and tied the axis-cylinders within lie in contact (Fig. 4, 3). But they have not been injured by the stitches, nor are they compressed by them, and the conditions are as favorable physiologically for nerve union as we can make them.

In spite of the mechanical cleansing of the surrounding wound it is still potentially septic; therefore I must prolong my operation to endeavor to protect this nerve suture. That I will do by quickly opening the lateral surface of the thigh, on the same side, by cutting out a quadrilateral piece of subcutaneous fat  $3\frac{1}{2}$  inches long by 2 inches wide. This fat is removed with-

out injuring the fascia lata. That thigh wound is closed at once by silkworm-gut stitches.

The fat is wrapped around the sutured nerve like a cigarette paper around tobacco, and held by light catgut stitches, one or two of which also hold it to the surrounding structures so that it will remain in place. That will protect the nerve suture from some adhesions of scar formation in this wound area, and if sepsis occurs in the large wound, it may save the nerve from infection while the suppuration is being overcome (Fig. 4, 3). The skin we shall close with silkworm-gut, leaving a small vaselin gauze at the upper angle. If this forearm is extended in the near future it will pull out the stitches in the nerve sheath and ruin the attempt at repair. Again we must use a splint, although there is no fracture, and a Thomas right-angled arm splint is put on over the dressings, with written instructions pinned on the outside, calling the ward officer's attention to the fact that the splint must not be removed nor the forearm once extended.

*Note.*—The second day after operation the wound was dressed. Some discharge was present. A fresh drain was inserted, and a moist Dakin dressing applied. The infection became increased in the next few days, and several skin stitches had to be removed. Gradually the condition subsided, and, from all appearances, came under control. The fat around the nerve remained intact, and did well in face of the infection. Some granulations began to appear, and after twelve days the patient had to be sent to the base with hope that the nerve connection was intact, and that the wound would gradually close. The thigh wound healed by primary intention.

We have spent considerable time on this patient, but the effort is worth while, both to him and to his country.

CASE V.—The next patient is waiting on the other table. The lieutenant tells me it is a superficial, though soiled, wound. He is F. R. ———, Sergeant ——— Infantry. The wound is on the outer aspect of the right thigh, a grazing G. S. W., with overhanging dirty skin edges. That wound probably does not go below the fascia lata—it may. We must excise it. There is no nitrous



oxid, and because the novocain infiltration demands some wait for full benefit, not to keep a table waiting I shall use the DePage anesthetic.

The wound area is first shaved and prepared. The anethetist has a circular bag of oiled silk, with a purse string of tape about its base, and a small hole the size of a silver dollar cut in the center. This is lightly packed with cotton, and the use of the anesthesia, which takes effect quickly and will last five to ten minutes, is explained to the patient. His co-operation is requested, namely, that when this bag is drawn taut about his face, although he feels that he is smothering, he must breathe in. The hole in the center permits some air to pass in, although the impervious mask is drawn about his face, but this air, in passing, becomes saturated with the mixture which we shall put on the cotton, and that mixture he will then inhale. We make up the solution fresh each time we desire to employ it. The formula is:

Ethyl chlorid.....	1 part
Chloroform.....	5 parts
Ether.....	24 parts

The preparation is made in a small bottle with a glass cork, or a large glass syringe barrel, to prevent evaporation. When this is mixed it is quickly turned into the cotton within the mask, which is folded down over the patient's face, the purse string is drawn, and he is instructed to breathe.

You will observe that the first two breaths are fairly deep, then he gasps a little and wants to stop breathing, but we encourage him. Soon he has to breathe, and after a few struggles he is taking deep inspirations, and within a minute is relaxed and, best of all, is anesthetized so that I can go ahead and operate.

Quickly the wound is excised, all soiled tissue is removed. In one place the fascia has been nicked, his subcutaneous fat has saved him from a wound through the muscle. All damaged tissue has been removed. This would be an ideal case for primary suture if we were permitted to perform them. The patient has not felt a thing. He has not moved since the first

struggles stopped. The operation is finished, and the mask has been taken off his face, and he still lies there as limp as a rag, but with good color. Frequently when coming out of this anesthesia the soldiers talk or laugh or, if they have full stomachs, vomit. No untoward effects are found. It reminds me very much of the ether rausch I use frequently in civil practice for reducing shoulder dislocations.

And so the night goes on.

# CONTRIBUTION BY LIEUT.-COLONEL FREDERIC A. BESLEY

FRANCE

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## SECONDARY HEMORRHAGES AS OBSERVED IN WAR SURGERY

*Summary:* Secondary hemorrhage practically unknown in civil practice; frequency of in war surgery; source of secondary hemorrhage; causes—hemolytic streptococcus the most active organism—careless use of Carrel-Dakin solution considered a causative factor by many observers; signs and symptoms—secondary hemorrhage from lung rare in war surgery; treatment—temporary methods—necessity for ligation of vessel in every case of severe secondary hemorrhage where patient's condition permits; frequency of secondary hemorrhage in compound fracture of the maxilla; treatment of shock following hemorrhage; value of artificial fluid to replace loss of blood; best treatment transfusion—Moss's method of determining reaction of recipient's blood—methods of transfusion—indirect method the one of choice in war surgery—technic.

THE present generation of civil surgeons had come to regard secondary hemorrhage as an avoidable complication, and it was a rare occurrence in civil practice even in hospitals where a large number of emergency accidental wounds were seen and treated. Aseptic technic and the early and prompt treatment of potentially infected wounds had resulted in minimizing extensive suppuration, and reducing the number of secondary hemorrhages to a negligible figure.

Surgeons had become indifferent to the possibility of this serious, sudden, and often fatal complication. Secondary hemorrhage was rarely thought of, and less frequently discussed. The advent of war, with its thousands of infected wounds and injured coats of blood-vessels, soon gave convincing evidence of the frequency with which secondary hemorrhage occurred, and taught the necessity of guarding against it and of applying adequate treatment when it did occur.



**The Source of Secondary Hemorrhage.**—The active bleeding in secondary hemorrhage may occur from either the artery, vein, or the capillaries, the former being much the more severe and dangerous. Venous hemorrhage is rarely fatal unless it recurs repeatedly and from a large vein. Capillary hemorrhage is rarely, if ever, serious.

**Causes of Hemorrhage.**—In discussing the cause of the hemorrhage it may be said without thought of contradiction that infection and subsequent suppuration is the underlying pathologic condition responsible for all secondary hemorrhage if, in making this statement, we consider the many modifying influences. The chief modifying factor is injury to one or all of the coats of the vessel wall.

General blood infection or bacteremia may be responsible in part for severe secondary hemorrhages as well as local suppuration. A general sepsis may predispose to hemorrhage by reducing the coagulability of the blood, and this is particularly true in the cases of hemolytic streptococcic bacteremia. A local spreading suppuration which tends to destroy the vessel walls and the thrombus within the vessel is the potent and determining factor in a secondary hemorrhage. Obviously the hemolytic streptococcus is the most frequent and most active organism in the dissolution of the thrombus or the destruction of the vessel wall.

In any given suppurating wound it must be quite evident that the distal portion of the clot which occludes the vessel and prevents the hemorrhage is always infected, and necessarily exposed to suppuration, but the more proximal portion of the thrombus remains aseptic and is the barrier preventing hemorrhage. If the entire thrombus becomes infected and breaks down, or a rupture occurs in the vessel wall, hemorrhage ensues. What are the factors controlling this phenomenon?

The relation between the virulence of the organism and the resistance of the tissues is always to be considered. The hemolytic streptococcus is probably the most important and virulent organism in this connection in so far as solution and destruction of the protecting thrombus is concerned. Careful observation

and investigation of many of these vessels, seen clinically, tend to show that dissolution of the clot alone rarely occurs, and that this is usually accompanied by evident inflammation of the vessel wall as shown by exudation into the tissues of the vessel with subsequent rupture. Rupture is facilitated by any injury to the coats of the vessel wall.

Further study will probably demonstrate conclusively that inflammation of the vessel wall with accompanying rupture is much more frequently the cause of secondary hemorrhage than the dissolution of the protecting thrombus.

In the opinion of many observers, Carrel-Dakin solution used carelessly or in excess predisposes to the destruction of the thrombus and vessel wall. Injuries to the vessel wall occur frequently in penetrating war wounds, and yet it is surprising how often the missile passes close to the vessel without injury to any of its coats. The injury to a vessel wall resulting in either a true or false aneurysm obviously predisposes to secondary hemorrhage, which is much more apt to occur if suppuration ensues.

**Signs and Symptoms of Secondary Hemorrhage.**—A secondary hemorrhage may be external, occurring on the surface and therefore self-evident, or it may be concealed in the abdominal cavity, the pleural cavity, or into tissue spaces. Hemorrhage into tissue spaces rarely gives rise to dangerous symptoms unless it takes place, first, in a thigh where the injury has rendered the muscles capable of wide separation, second, in the retro-peritoneal space in the abdomen, or third, into the loose tissues of the pelvis behind the peritoneum. The diagnosis of an external hemorrhage is not difficult, but the severity of the symptoms produced is not always in direct proportion to the amount of blood lost. Given a patient weakened by prolonged sepsis, and he will be more markedly affected by the loss of a relatively small amount of blood than the healthy, robust man.

The visible external hemorrhage, together with the evidence of shock as manifested by the pallor, cold, damp skin, sighing respirations, rapid pulse, subnormal temperature, and lowered

blood-pressure, enables us to make a diagnosis of the severity of the hemorrhage and its results. If the hemorrhage be internal or concealed, one is obliged to make a diagnosis of its existence and severity from the symptoms and signs of shock plus the physical findings of fluid in the peritoneal or pleural cavities.

It may be said that the experiences of this war have taught that secondary hemorrhage from the lung is so rare as to be almost disregarded. A contralateral collapse of the lung, which is frequently seen, simulates very closely a secondary hemorrhage from the lung. Secondary hemorrhage into the peritoneal cavity occurs more frequently. One of the most common concealed hemorrhages occurs in the retroperitoneal space either in the pelvis or in the abdomen. These are often very severe and difficult to control.

**Treatment.**—At first thought the treatment of secondary hemorrhage, particularly from an external source, would appear to be a relatively simple procedure. It can be stated fairly, however, that secondary hemorrhage is a complication that often taxes all the skill and mature judgment of a surgeon with a large experience in war surgery. The treatment is rendered more difficult by reason of the local and general sepsis that usually, if not universally, accompanies the bleeding.

Frequently a severe hemorrhage will stop spontaneously or be checked with local pressure. The application of a constrictor for a few minutes results in the stopping of the bleeding, with no immediate recurrence, when this constrictor is removed. This gives a false sense of security. Surgeons of limited experience with this condition are often tempted to let well enough alone, and delay. This procedure is rarely, if ever, permissible. If the hemorrhage has been at all severe or if it has produced any material constitutional disturbance, immediate treatment should be instituted. Experience has taught that no severe hemorrhage occurs without the opening of a large artery or vein, usually the former.

Almost without exception a subsequent larger and frequently fatal hemorrhage will recur, unless the vein or artery effected



be securely ligated and adequate drainage provided for the control of the local suppuration.

It should be a universal rule that ligation of the vessel should be practised in every case where a severe secondary hemorrhage has occurred as soon as the patient's condition warrants the operation. No attempt should be made to carry out this procedure in a ward, but the patient should be removed to a well-equipped operating-room at once and the operation regarded as a major one, with careful observance of a thorough aseptic technic.

A strict adherence to this rule is true conservatism, and any palliative measures will cost lives. As a matter of routine, this ligation should not be carried out until the severe shock is combated.

If the hemorrhage is temporarily controlled by local pressure, methods for combating shock may be instituted without endangering the integrity of the limb. If it is necessary to apply a tourniquet to the limb to control the hemorrhage, then it is a matter of mature surgical judgment to determine the question of sacrificing the limb, to the end that life may be saved by the treatment of the shock. Assuming that it has been decided to amputate the leg, the shock should be completely overcome before proceeding with the operation, even if this involves the delay of several hours. The practice of doing an immediate amputation should be discouraged, for this additional shock is often the determining factor in an immediate fatal termination. This is particularly true in compound fractures of the femur with extensive suppuration.

In this class of cases a preliminary high ligation of the femoral artery under a local anesthetic is sometimes advisable. Severe secondary hemorrhages frequently occur in cases of compound fracture of the maxillæ, accompanied by deep laceration of the soft tissues of the floor of the mouth. Extensive sloughing of the tissues in this location is prone to occur because of the mixed infection and the inadequate drainage.

In cases of severe secondary hemorrhage from the floor of the mouth, where the loss of blood is sufficient to produce grave

constitutional evidence of shock, it is inexpedient to palliate, and an early ligation of the external carotid should be done immediately. A large stomach clamp, the blades of which are protected by rubber tubing, can be used to good advantage in grasping the large mass of this sloughing tissue in the floor of the mouth, and thus check the hemorrhage temporarily.

**Treatment of Shock.**—It would be futile to attempt to discuss the various theories regarding the causes of shock at this time, for it would lead us far afield. In spite of the exhaustive work that has been done on this subject since the beginning of the war, little accurate or scientific knowledge has been added to the subject. Clinical observations by Cannon, Fraser, Crile, and others have added much to a better understanding of the value of certain methods of treatment. The deductions of these investigators make it clear that the application of heat is one of the best and most potent agencies in the restoration of a normal blood-pressure. The application of heat should, therefore, be employed in every case of severe shock following hemorrhage.

The question of the use of various artificial fluids to replace the loss of blood has been the subject of much investigation and serious discussion. These investigations have led to the general belief that Ringer's isotonic saline solution has little or no therapeutic value and its use may be harmful. Bayliss states that "experimental evidence does not warrant much reliance being placed in hypertonic salt solutions." If bicarbonate of soda solution alone is of great value, it has not been demonstrated clinically. The use of an artificial solution composed of 6 per cent. gum arabic and 1.5 to 2 per cent. bicarbonate of soda to prevent hemolysis and, perhaps, neutralize acid products, has been practised extensively, and very favorable results are reported. Its value is dependent upon the viscosity of this fluid, which prevents its rapid dissemination into tissues. It has been noted that this solution maintains the normal blood-pressure longer than any other artificial solution.

Artificial solutions are not comparable in value to the transfusion of blood in restoring and maintaining permanent, normal blood-pressure after hemorrhage. Since secondary hemorrhage

nearly always occurs at the evacuation hospital or the base hospital, it is possible and feasible to obtain donors at these locations, and it is the one single form of treatment that should be considered. It has been found practicable to secure donors without difficulty and to have a number of them grouped and prepared for any emergency. It is customary in the British Army to give a donor a leave to England, and almost any soldier is willing to furnish the necessary quantity of blood if promised a "Blighty." American soldiers have been more than willing to act as donors without the promise of reward, and in several cases they have voluntarily offered blood to be used in transfusing British soldiers. Naturally, it is necessary to determine the reaction of the recipient's blood, so that transfusion may be a safe procedure. The simplest method is the one devised by Moss, who found that all individuals fall into four groups, as follows:

## MOSS'S CLASSIFICATION

Serum of group.	Cells of group.				Number of individuals in group.
	I.	II.	III.	IV.	
I	0	0	0	0	I = 8 per cent.
II	+	0	+	0	II = 40 "
III	+	+	0	0	III = 12 "
IV	+	+	+	0	IV = 42 "

Group IV donors may be used in all cases with safety without the necessity of testing the recipient's blood.

**Methods of Transfusion.**—As Robertson aptly puts it, transfusion of blood should be regarded essentially as a transplantation of tissue, and demands the same attention to detail that is necessary in performing such an operation. The direct method of transfusion is practically never employed in war surgery, as the indirect method is much simpler and more adapted to this type of operation. There is a growing tendency to use blood modified by citrate of soda rather than the unmodified blood of the donor transferred in paraffin tubes. The former method has been advocated and generally adopted for use in the American Army. In this connection it should be noted that no matter what method is employed, the greatest care should be exercised in avoiding rough handling of the blood. Shaking, flowing over



rough surfaces, delayed flow of blood, and prolonged contact with foreign surfaces should be prevented. It is essential to preserve the integrity of the platelets in every possible way. It can be fairly maintained that the unmodified blood is preferable if the method can be simplified. The fact that this method more generally destroys the veins of the donor and the recipient has not proved a serious disadvantage in clinical experience. The two following methods of technic simplify the coating of the tubes with paraffin; this is generally true of the solution of paraffin in ether, which is employed as follows:

*Cold Method of Coating Transfusion Tubes.*—Dissolve in ordinary ether hard paraffin in proportion of 1:80 to 1:20. It is not necessary to sterilize paraffin. Autoclave Kimpton tubes and, after removing, wash out with methylated spirit and follow with ether. Permit to dry. Pour an ounce of the ethereal solution of paraffin into the tube and, after replacing rubber stopper, shake well and pour excess of liquid out of the large end. After a few moments of drying the tubes are ready for use.

*Hot Water Method.*—Sterilization of tubes—1. (a) Tubes may be boiled and used while still hot or warm, in which case they must be dried outside and inside. A long dressing forceps with gauze will clean the inside sufficiently. It is not necessary to have complete drying, but the drying removes sediment from the inside of the tube, from the rust of articles, and débris of the sterilizer which is nearly always present.

(b) Tubes may be washed, dried with ether or alcohol, and sterilized in autoclave. This second method gives a slightly more uniform coating of paraffin because it prevents the sterilized sediment from clinging to the sides of the tube. This sediment very often is the cause of air-bubbles collecting on the paraffin-coated tube surface.

2. Ordinary paraffin is heated directly on stove for sterilization. It is then set in hot water-bath for use, to prevent cooling, or if the tubes are boiled at the same time, it may be set in sterilizer and kept hot in it. No definite temperature can be stated for the water, as this varies with the heat and consistency of the paraffin. A rough estimate which may be used is to have

the water about as hot as can be tolerated when poured on the forearm.

Two persons with sterile gloves, gown, mouth gauze, etc., are found convenient for preparing tubes. Tubes are of two types—one with two cannulæ, and the other with one cannula



Fig. 5.—*a*, Paraffin; *b*, level of hot water in cannula.

at the bottom. The tube is covered with gauze to prevent burning the hand, and grasped at its center. The tube is tilted at an angle and the hot water is poured into it very gradually, bringing the tube upright until the tube is filled to a level just below the upper cannula (Fig. 5); or in the case of the tube with one cannula, to within 2 inches of the top. This is done to avoid

allowing air-bubbles to be carried in and to cling to the sides of the tube. This occurs when the water is allowed to splash in. Bubbles collecting along the sides of the tube remain and spoil the smoothness of the paraffin coating.

The water is held in the tube by a gloved finger, covered with gauze, placed over the cannula at the top and over the one at the bottom as well. The assistant now pours the heated paraffin on to the surface of the hot water, filling the tube to level full. The hot water is now allowed to flow out at the bottom cannula, and as the surface of the water recedes more paraffin is poured in to the amount of 2 ounces. A good guide is to pour paraffin in until it reaches from the top cannula to the top of the tube.

Continue to allow the hot water to escape from the bottom cannula, noting the thickness of the coating of paraffin. This thickness can be controlled by the rapidity with which the hot water is allowed to escape from the lower cannula. When the paraffin is still a little above the top cannula, the tube should be carefully tilted away from it, so that the paraffin is allowed to flow out of the top cannula, thereby preventing its complete blocking.

There is sometimes difficulty in getting the last paraffin through the lower cannula before it hardens, thus blocking the lumen. This is obviated by placing the end of the tube into hot paraffin which is accessible in its container. Just as the last few drops are coming through the bottom cannula, the tube is quickly tilted upward, allowing the paraffin to run back, otherwise it would remain in the cannula and block the opening. If the lumen remains blocked in spite of this manipulation, a heated fine-pointed sterile probe can be used to obtain an opening.

The unperforated cork used in the two cannulae type of tube is dipped into the paraffin and while still warm placed in the tube. The perforated cork with the glass tubes in its center may be treated in the same way. It is well to dip the entire outside of the cork and the upper end of the tube into warm paraffin after the cork is in place.

A few attempts are usually necessary to develop the technic of a smooth coating. It then becomes quite easy to judge the



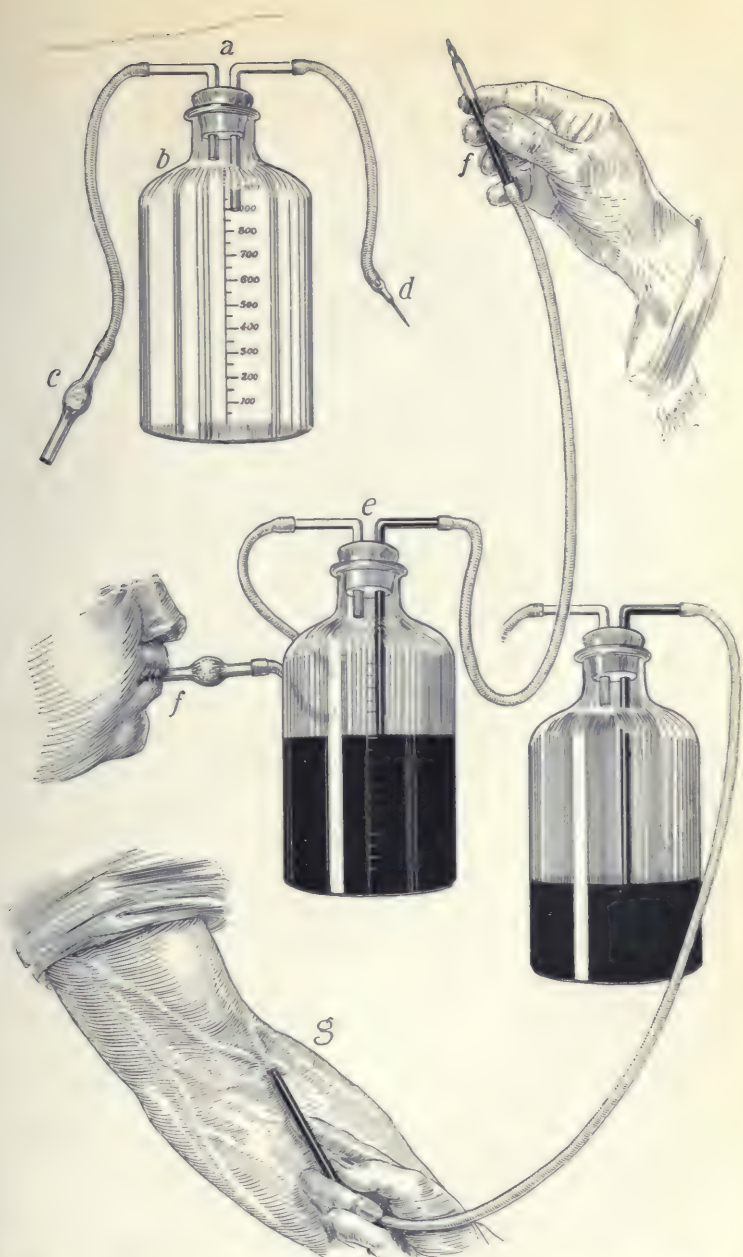


Fig. 6.—Blood transfusion: *a*, Rubber stopper with two glass tubes; *b*, liter bottle; *c*, glass suction tube (cotton in bulb); *d*, transfusion needle; *e*, rubber stopper with two glass tubes, one long enough to reach within 5 mm. of bottom of bottle; *f*, filling siphon with blood (cotton in bulb of glass compression tube); *g*, introduction of blood into patient.

consistency of paraffin, heat of the water, and rapidity of allowing the water to run through, which is necessary for a smooth coating. It has been found that ordinary paraffin works much better than mixtures containing vaselin, beeswax, etc. For cleansing the tube, ether soap and water (hot), and later benzine have been found to be the best solvents for paraffin.

It is maintained by Lee and others that blood modified by the citrate method has no dangers, and the advantage of being simpler and of not destroying the veins. Little is required in the way of apparatus. A liter bottle, two rubber stoppers, having two perforations, and sufficient rubber and glass tubing are all the necessary essentials. The attached figures and descriptions are taken from a pamphlet published by the American Red Cross in France (Figs. 5, 6).

The value of the transfusion of blood in patients suffering from the shock accompanying secondary hemorrhage cannot be overstated. It far surpasses any other method in restoring and maintaining the normal blood-pressure, and should be used in every case of severe shock following a hemorrhage as a preliminary to operative procedure. The remarkable results that have been obtained through the use of transfusion of blood are far-reaching, and the general practice has saved many lives.

# CLINICAL LECTURE BY DR. VICTOR D. LESPINASSE

NORTHWESTERN UNIVERSITY

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## BLOOD TRANSFUSION<sup>1</sup>

*Summary:* Difficulty encountered in blood transfusion—methods employed to obviate clotting of blood; indications for transfusion—class of cases met with in army work; methods of testing blood—technic of the Moss test; selection of donor—the ideal one; methods of direct transfusion—use of iridio-platinum tubes; paraffined cylinders; indirect transfusion—cylinder citrate method; citrate method—apparatus necessary; disadvantages; reactions following transfusion—transmission of disease; comments.

THE whole subject of blood transfusion is rather extensive, and in the little time allotted to us I think we had best concentrate on one or two reliable workable methods. During this period I can give you the exact details of the technic of these methods and you can use them until you acquire experience, and then, if you wish, you can modify them or develop methods of your own. Blood transfusion is a matter of technic pure and simple, and the technic is a matter of detail. If you omit any one of the minor details you will have failure, whereas if you carefully observe all the minute details of technic you will have success.

The chief difficulty encountered in blood transfusion is the clotting of the blood. Circulating blood is fluid. If you can keep it fluid there will be no difficulty in removing it from one individual and putting it into another, no more difficulty than you have in giving saline solution or intravenous injections of any sort.

To obviate the clotting of the blood many methods and substances have been employed. The first to be used was the care-

<sup>1</sup> Given to the members of the Dental Reserve Corps, U. S. Army, March 15 and 22, 1918.



ful handling of the blood-vessels while they were being sewed together. Next the Crile cannula was developed and presented to the profession. At one time this was the recognized surgical method of performing the operation of transfusion. Next tubes of various sorts, such as those of glass, as devised by Brewer, and the iridio-platinum tubes, such as I developed, were used, and today these methods are the simplest means of performing a direct transfusion. Later the so-called indirect method with the use of multiple syringes or paraffin-coated glass cylinders was used, and lastly we have the use of anticoagulants, the principal one of which is sodium citrate.

**Indications.**—The chief indication for transfusion is acute anemia, such as comes from the wounding of large blood-vessels. The next indication is to supply fresh blood containing antibody and complement to enable the recipient to overcome infection. In this indication it is best to use blood which is immune to the particular infection, if such a one is obtainable. An intermediate group between hemorrhage and sepsis is the group embracing purpura hemorrhagica, hemorrhagic disease of the newborn, and acute infectious diseases. This group combines the two indications for transfusion, namely, hemorrhage and sepsis. In some of the clinical pictures in this group the predominant picture is that of sepsis, and hemorrhage is in the background. In other members of this group the reverse is true. In cases where hemorrhage is the predominant clinical picture transfusion is a marvellously curative procedure. In cases where sepsis is the predominant clinical picture the results of transfusion are not so readily determinable. The class of cases that will be met with in the army are mostly of the acute hemorrhagic type from wounds, although there are a large number of cases of peculiar types of sepsis which experience may show can be best cured by transfusion.

**Testing of Bloods.**—The present method of determining the miscibility of one blood with another has resolved itself into the determination of the presence of iso-agglutinins. This classification of bloods was originally devised by Moss, and it has stood the test of practical experience perfectly. He divided

individuals into four groups, calling them Groups 1, 2, 3, and 4. It was found that about 10 per cent. of individuals belong to Group 1, about 7 per cent. to Group 3, 40 per cent. to Group 2, and 43 per cent. to Group 4. To determine the individual's group it is necessary to have sera from Groups 2 and 3. If these sera are mixed with corpuscles of Groups 1, 2, 3, and 4, you will have agglutination or non-agglutination, as shown by the following table:

Sera.	Corpuscles.	Results.
Groups 2 and 3 mixed with	Group 1 equals	Agglutination for both.
Groups 2 and 3 mixed with	Group 2 equals	Negative for 2 and agglutination for 3.
Groups 2 and 3 mixed with	Group 3 equals	Agglutination for 2 and negative for 3.
Groups 2 and 3 mixed with	Group 4 equals	Negative in both.

By comparing the result obtained in the test with the known standard as shown above, we can determine at once the proper group to which the individual recipient belongs. If possible a donor of his same group should be selected. If no donor of this group is available, we can use as a donor an individual from any group whose corpuscles are not agglutinated by the recipient's serum. The donor's serum may be disregarded in this connection, as it is introduced in relatively small doses and immediately diluted by the large mass of the recipient's sera. Consequently, by studying the following table we can see which individuals are suitable as donors for the recipients of the different groups. Any individual belonging to a group where there is a minus sign in the table can be used as a donor for the recipient group upon the same line:

Sera of recipient.	Corpuscles of donor.			
	Group 1.	Group 2.	Group 3.	Group 4.
Group 1.....	—	—	—	—
Group 2.....	+	—	+	—
Group 3.....	+	+	—	—
Group 4.....	+	+	+	—

As you see from this table, Group 1 is the universal recipient, and, hence, any individual in Group 1 can be transfused safely

from any other individual. A recipient belonging to Group 2 can be transfused only with blood from Groups 2 or 4. A Group 3 patient can be transfused only from an individual in Groups 3 or 4, while for a Group 4 patient we must have a Group 4 donor, as none of the others are suitable. Group 4 is the universal donor because its corpuscles are agglutinated by no serum. When a donor outside of the individual's own group is used, there is an increased percentage of reaction. The sera of Groups 2 and 3 can be preserved sterile in ampules, or they can be dried on paper according to the method of Hartman, as published in the *Journal of the American Medical Association*, November 16, 1918, so as to have them available at all times.

**Technic of the Moss Test.**—To make an agglutination test we must have corpuscles and serum from the prospective recipient as well as corpuscles and serum from each of the prospective donors. The corpuscles are obtained by putting 1 to 3 drops of the blood into 1 c.c. of  $1\frac{1}{2}$  per cent. sodium citrate solution dissolved in 0.9 per cent. salt solution. The serum is obtained in the usual way by allowing the blood to clot and the serum to separate, or by putting fresh blood into a centrifuge and centrifuging it. The mixture of the blood, sodium citrate, and salt solution is now called "cells." One drop of this cell mixture is now added to 2 or 3 drops of serum from each of the prospective donors. This had best be done by using a hanging-drop slide. Next the corpuscle mixture from each of the prospective donors is mixed in the same proportion with the cells of the recipient. It is best to make two sets of slides to enable one to have a check on the results. Agglutination, if it takes place, comes within a few moments as a rule, but the slides should be left at least an hour before final judgment is passed. When the agglutination is marked the cells are drawn together in groups. The reaction then is evident macroscopically, and we have a bilocular brick-dust sediment occurring throughout the slide. If the bloods are not agglutinated on both slides, that individual is suitable for a donor. If the prospective donor's serum agglutinates the recipient's cells, in an emergency that in-



dividual may be used because the serum injected is injected in relatively small amounts, and is immediately diluted by the large volume of serum in the recipient and, consequently, will do a minimum amount of harm.

**Selection of Donor.**—In selecting a donor after we have determined the miscibility of his blood, we should select as large an individual as possible and one with as large veins as possible. In drawing the blood from the prospective donor to determine his group or suitability for use, we should draw it from the smaller veins low down in the forearm, leaving the large trunk veins free from puncture so they can be used in the operation itself.

The ideal donor is a large individual, tall and rangy, whose superficial veins of the forearm are so arranged that they all flow into one common trunk at the bend of the elbow. If this sort of an individual can be obtained any method of puncture transfusion can be carried out, as the large veins can be punctured by a large needle and 500 to 1500 c.c. of blood withdrawn in a very few minutes.

It is also of importance in selecting a donor to choose one with as stolid a temperament as possible, so that he or she will co-operate with the operator throughout the operation, and not spoil everything by lack of co-operation at some critical moment.

**Technic of Direct Transfusion, Using Iridio-platinum Tubes.**—The radial artery of the donor is dissected out under local anesthesia for about an inch. The small branches are doubly clamped and doubly ligated. As the blood is flowing through the artery its diameter is carefully measured with a millimeter gage. A heavy silk ligature is now passed beneath the artery. Traction is made upon this, pulling the artery out of the wound. A blood-vessel clamp is now applied to the artery in the proximal angle of the wound, and then an artery forceps is applied to the artery in the distal end of the wound; the artery is now severed just proximal to the artery forceps. Immediately the vessel is washed with saline solution, the adventitia is grasped in fine forceps, pulled down, and cut off flush with the vessel end (Fig. 7, *a* and *b*). Next the end of the artery in the grasp of the artery

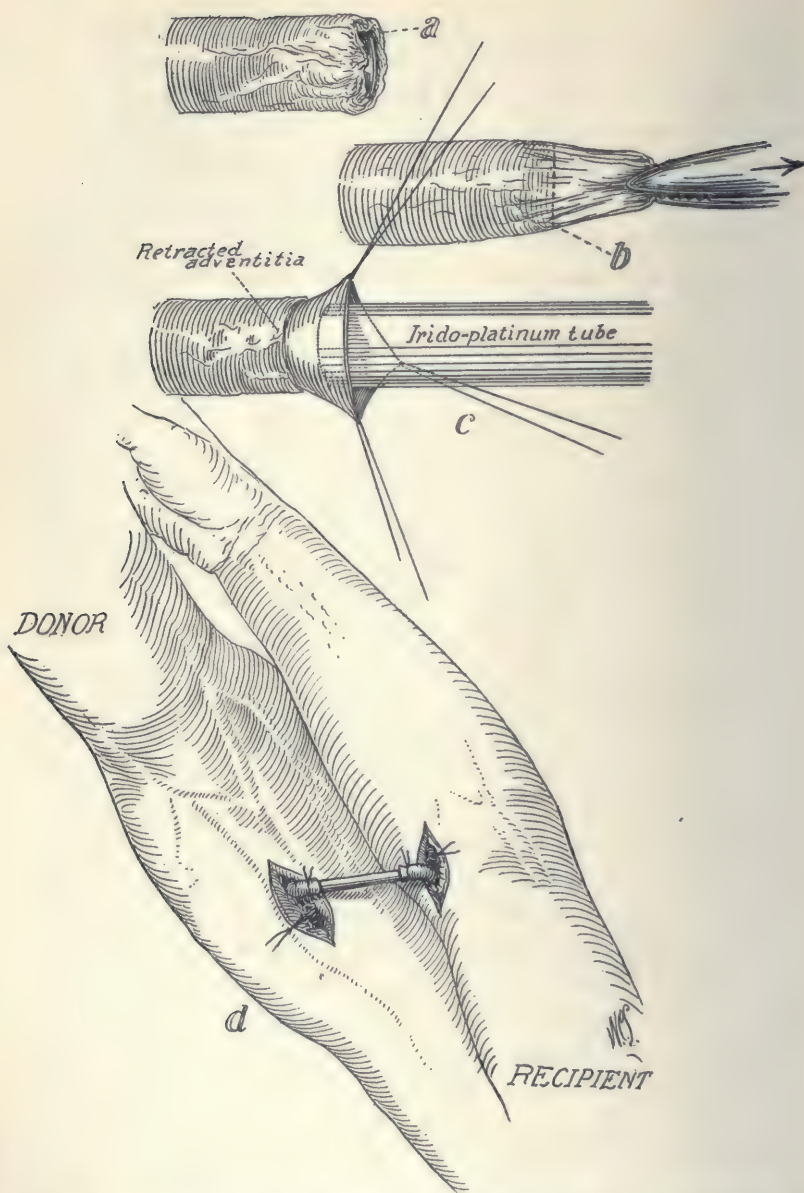


Fig. 7.—Direct transfusion, using iridio-platinum tubes: *a*, Loose adventitia at severed vessel end; *b*, adventitia pulled down and cut; *c*, vessel retracted by means of three guy sutures to permit insertion of tube; *d*, transfusion in progress.

forceps is ligated. While an assistant plays a constant stream of solution in the vessel end, the artery is gently stripped from the upper clamp to the cut vessel end, thus removing all free blood and clots from the lumen. Three fine sutures, piercing all the arterial coats, are now passed through the proximal end, so that traction upon them will open the vessel end wide. While traction is being made on these guy-ropes, the iridio-platinum tube is inserted into the open arterial end (Fig. 7, *c*) and the artery gently ligated to the tube. The same technic is now carried out upon one of the superficial veins of the forearm. The clamp in the vein is removed, then the clamp on the artery is removed, and blood begins to flow.

**Technic of Direct Transfusion by Means of Cylinders.**—In using the paraffined cylinders for transfusion the special point in the technic is the even coating of the inside of the cylinder with the paraffin. This is done in one of two ways, either by heating the tube in the oven after placing the requisite amount of paraffin in it, and then when the tube and the paraffin are warm to roll it around in such a way that the paraffin is distributed and hardens as an even coat over the entire inside of the tube. The other method is to place the paraffin in the tube and then heat the tube over a Bunsen burner, gradually rolling the cylinder to see that the paraffin is distributed as evenly as possible over the inside of the tube. Great care should be exercised so that the outlet of the tube is not occluded by the melted paraffin. To my mind this method has a limited value, as it comes in competition with the direct methods if it is necessary to cut and expose the vessels to use it. If you try to use this method by simply distending and puncturing the veins, unless you have extremely large veins, you will find that the large amount of blood necessary cannot be aspirated in the few moments before clotting occurs.

A modification of this cylinder method is known as the "multiple syringe" method, in which we simply have a large number of 20- to 30-c.c. syringes. A syringe is filled with blood and disconnected. Then another syringe is attached and the assistant begins withdrawing the plunger, thus filling the second





Fig. 8.

syringe with blood. While the assistant is filling the second syringe, the first one is transferred to the needle that has already been inserted in the vein of the recipient, and the syringe discharged into the vein. As soon as discharged the first syringe is replaced by the second. This process is carried on until the required amount of blood has been transferred.

Occasionally between the syringefuls of blood a syringe of salt solution is injected through the needle in the vein of the recipient to clear the vein and to prevent accumulation of blood-cells in the needle. This method is facilitated by using the special cannula devised by Lindeman, which consists of a cannula accurately fitted with a needle trocar, through which one is able to aspirate the blood and thus determine definitely that he has entered the lumen of the vein.

**The Cylinder Citrate Method of Indirect Transfusion.**—A large cylinder holding 500 c.c., with needle attached to one end and a suction-pump attached at the other, is sterilized. The inside of the cylinder is moistened with a 10 per cent. citrate solution and about 10 to 20 c.c. of the citrate solution is allowed to remain in the cylinder. As you see, this amount of citrate is insufficient to absolutely prevent clotting, but it will retard clotting for several moments, or for a sufficient length of time to enable us to fill and discharge the cylinder, simply by puncturing the veins in both donor and recipient.

The only point in the technic which differs from the simple sodium citrate transfusion is that the needle should be inserted into the vein of the recipient before we start to draw the blood from the donor. The assistant holds the needle in place and gradually injects salt solution in sufficient volume to keep the needle clear throughout the time necessary to fill the cylinder from the donor. Then the needle attached to the large cylinder is inserted into the vein of the donor and suction made with the pump. When the cylinder is full of blood it is removed from

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Fig. 8.—Cylinder citrate method of indirect transfusion: *a*, Insertion into vein of recipient and testing the stick by injection of water; *b*, needle in vein of donor and cylinder filling with blood; *c*, syringe filled with water replaced by tube of blood, and blood being forced into vein of recipient.

the needle. The syringe is removed from the needle that has been placed into the vein of the recipient and the cylinder attached, the pump reversed so that it now pushes instead of sucks, the pressure is applied, and the blood is injected. This, to my mind, is the ideal method of indirect citrate transfusion (Fig. 8).

**Citrate Method.**—With the citrate method we have a definite means of measuring the blood. The blood is drawn into a graduated vessel and we know exactly how many cubic centimeters of blood are withdrawn. Therefore it is not so essential to watch the donor's pulse so carefully. We must know how much blood the donor is losing, and we know that with this method; furthermore, we can stop drawing blood whenever we wish. An individual weighing 135 to 160 pounds can lose 500 to 800 c.c. with no danger. Where we have it coming into a vessel which we can measure, we know exactly what blood the donor is losing, and we can stop before any grave clinical symptoms of blood loss manifest themselves.

The strength of citrate used should be sufficient to make a 0.1 per cent. solution in the injected blood, that is 0.1 c.c. of a 10 per cent. sodium citrate solution to each 10 c.c. of blood. This is the minimum amount of citrate sufficient to hold in abeyance the clotting properties of the blood and keep it fluid indefinitely. The preparation and technic simmers down to mixing the blood with this citrate solution and then injecting it the same as you would salt solution. This, then, is blood transfusion in its simplest clinical form at the present time.

The apparatus necessary is a large needle or cannula, a piece of rubber tubing, a funnel or percolator, and a graduated beaker or flask to catch and measure the blood while it is flowing from the vein of the donor. As the blood flows from the vein of the donor into the beaker we should be constantly adding a sufficient amount of the 10 per cent. citrate solution. This should be stirred with a sterile glass rod to mix it intimately with the blood as soon as possible. It is not wise to add the citrate in excess, as something may occur to check the flow of blood, and then our solution will be overcitratated.



This method has the disadvantage of not being applicable in certain pathologic types of hemorrhagic disease, which you as army men will probably not meet or meet very rarely, and in causing a slightly higher percentage of blood reaction than with straight unmedicated blood. The general indications for transfusion of blood in army work would be sudden acute anemia from severe injury and severe sepsis, and the citrate method is applicable to all that type of cases. The citrate is eliminated rather rapidly by the kidneys, and unless you do a very massive transfusion or use a higher dose of citrate than  $\frac{2}{10}$  of 1 per cent., there is very little danger of toxicity from the citrate.

**Transfusion in Progress.**—The donor is requested to lie down upon a table, baring the arm which has previously been selected because of the size of the superficial veins. A constrictor is placed around the arm sufficiently tight to obstruct the venous return, but not sufficiently tight to obstruct the arterial inflow. He is told to flex and extend the fingers, and when the distention of the veins is maximum a large vein is punctured with as large a needle as possible. The blood coming through the needle is caught in a beaker and intimately mixed with the sodium citrate solution. When the desired amount has been collected the constrictor is removed, the needle withdrawn, and pressure applied to the point of puncture. The blood is now set aside momentarily.

A small syringe filled with salt solution is attached to another needle. A constrictor is applied to the arm of the recipient, and when the veins are distended they are punctured and a few cubic centimeters of the salt solution injected as a test of the puncture. If the puncture has been successful, the syringe is disconnected and a funnel or percolator attached to the needle, the blood is poured in, and allowed to run into the vein of the recipient.

**Reactions.**—Following transfusion there is frequently a temperature reaction with or without chill. Rarely do we have a chill without subsequent temperature reaction. These chills come on from a few minutes to an hour or two subsequent to the operation. At the time of the chill there is frequently a drop of temperature below normal. Subsequently the tempera-

ture rises to as high as 106° F. It maintains this peak for from one to ten hours, and then drops suddenly to normal. The chill and temperature are due to the parenteral ingestion of protein. The reactions are more frequent and severe when we have used blood that is not of the same group, but even when we use the same group blood a reaction cannot be absolutely prevented, as any test known at the present time has a certain fallibility. Individuals who have had multiple transfusions from multiple donors are more prone to have severe reactions on subsequent transfusions than they are at first.

Examination of the urine and vomitus during these reactions will show no blood elements, no hemoglobin, and a pure protein reaction, whereas in cases transfused with blood corpuscles that are agglutinated or hemolyzed by the recipient's serum a hemoglobinuria is present.

The treatment of these reactions is along general medical lines—external heat and stimulants. If the factor of anaphylaxis is prominent the use of atropin and adrenalin may give relief.

Another ill-effect in transfusion is a too rapid insertion of the blood, causing a dilatation of the heart. This may come on suddenly or it may manifest itself as a blueness of the fingers, toes, and lips in a half-hour to an hour, or even longer after operation. Evidently the heart is able to stand the strain for this length of time and then gradually decompensates. If the patient rests and is carefully treated, in twelve to twenty-four hours the heart gradually compensates again. This danger is particularly liable to occur where we are dealing with chronic anemia patients, and rarely occurs in young or middle-aged individuals suffering from acute anemia.

Transference of disease is liable to occur. Instances of the transference of syphilis and of malaria are recorded. An embolus may occasionally occur, as manifested by sudden pain in the chest and coughing, accompanied by bloody sputum, signifying an embolus in the lung, or by sudden sharp pain in the back, subsequently followed by bloody urine, indicating an embolus in the kidney. These phenomena, fortunately, are very rare with a careful technic.

## CLINIC OF DR. CARL BECK

### NORTH CHICAGO HOSPITAL

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#### THREE CASES OF FACIAL PLASTIC

*Summary:* Case I.—Keloid scars on face and deformity of eyelids following burns received during an epileptic seizure; plastic operation for restoration of eyelids—results.

Case II.—Crushing injury to nose; stages of reconstruction operation—results.

Case III.—Destruction of nose following treatment for an eruption; method of constructing a new nose; lesson to be learned from this case.

#### CASE I.—PLASTIC OPERATION FOR RESTORATION OF EYELIDS

THIS little boy is fourteen years of age, but rather undersized. Unfortunately, he is not entirely well-developed mentally, having been subject to epileptic seizures ever since he was a baby. These fits are quite severe, lasting from seven minutes to one-half hour, and at times are so frequent that one follows another on an average of six or eight a day. To one of these attacks he owes his present injuries and deformities. While taken suddenly with convulsions he fell upon a burning stove, producing burns over the right eye, nose, and on the side of the left eye, besides burns of a minor degree on the extremities. After long suppuration the burns on the eyes and face healed, but with the formation of keloid scars and a deformity of the eyelids on the right side. The upper eyelid is entirely missing, and in its place is a scar extending from the outer angle clear into the root of the nose. The conjunctiva bulges out in this place, and in trying to close the eye the protruding conjunctiva is drawn down not quite to the middle line. The lower eyelid is also burned out and forms what we call an ectropion (Fig. 9). The scar above the nose is keloid and so is the one on the outer angle of the left eyelid, but they do not interfere with the motion of the eyes. Owing to the ectropion the tears constantly run down the face and



keep it eczematous. There exists, therefore, a double indication to restore the eyelids, a functional and a cosmetic one. There is no eyebrow to speak of present on the right side. There is, therefore, a partial indication, if possible, to restore the eyebrow.

The cure of this deformity consists in the performance of a plastic operation. As the case is a very complicated one and a large number of scars already disfigure the face, the details of the operation must be well thought out before attempting res-



Fig. 9.—Photographs of Case I.

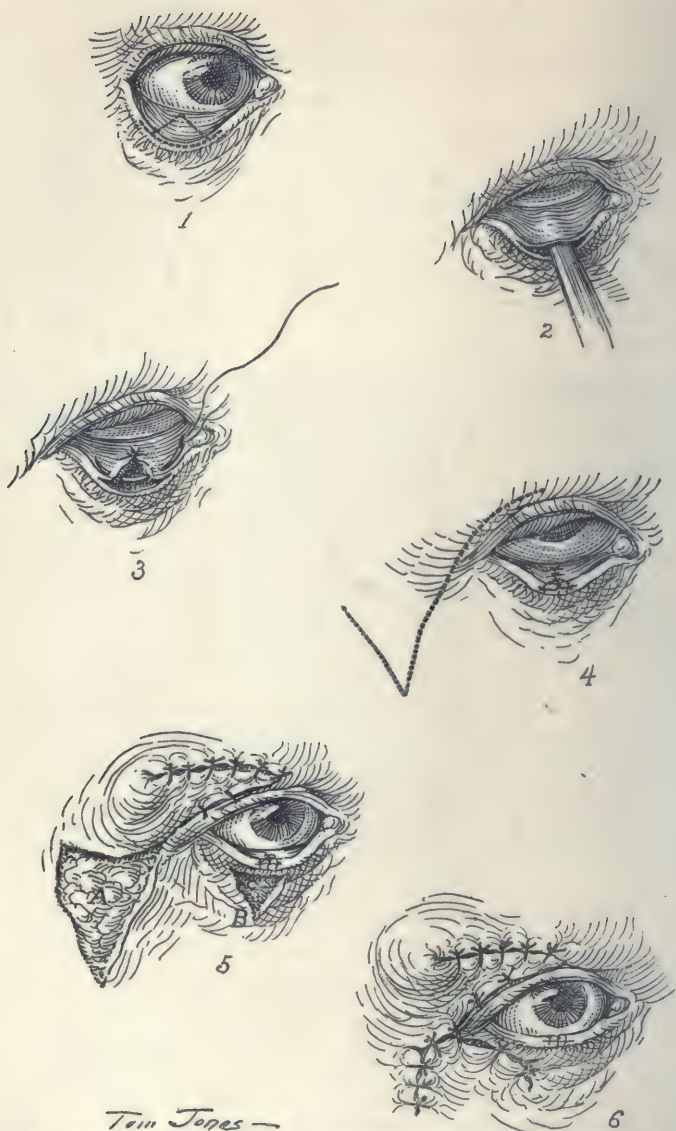
toration. The skin on the forehead and on the cheek seems to be the most available material for operation. The plan is to use a double flap with one single pedicle, if possible, to restore the upper and lower eyelids from the outside, and a frontal flap to supply the inner angle of the upper lid. To take a flap which would restore the whole eyelid in one piece would endanger this flap in its circulation, inasmuch as the largest portion of it has to be the one most distant from the pedicle.

The operation of restoration of the eyelids in this case consists of the following acts: First, the scar is dissected from the

upper eyelid. Fortunately, the border of the lid is not destroyed, but a part of the tarsus is, so that the eyelid has not the natural configuration of a cover of the eyeball with the convexity outward as it ought to have. Some portions of the muscles are also gone and what are left are atrophied. The lower lid is also freed of cicatrices by resecting accurately the scars from the portion below the same, and after it is made movable the upper and lower eyelids are brought together and sutured by three stitches over the eyeball. At this time we can see exactly the extent of the defect which we have to cover. We now form a large flap with two prongs, somewhat in the shape of the claw of a lobster, the larger one to cover the upper lid and the smaller one to form the cover of the lower one. They are taken from the temple where the skin is pliable and enough resistant to stand a twist of 45 degrees. The outer border of this skin is taken from the borderline of the hair and some of the hair is taken along to form the eyebrow. When we twist the flap into its shape we find that the extremity over the upper eyelid covers about two-thirds of the defect, so that about one-third in the region of the nasal root remains to be covered from the forehead. Here also a flap is taken vertically from the forehead and turned into the horizontal defect and sutured on to the flap from the outside. The defects on the temple and on the cheek are diminished by close approximation of the wound borders as far as possible, and whatever cannot be drawn together is left to granulate.

The result of this first operation was beyond our expectation. Primary union took place in almost every line of incision, and shortly after the operation the patient was able to close the eye without difficulty. For six months the result has been the same, even improving to a certain extent, except that the lower eyelid is gradually turning into a slight ectropion, but not as bad as before operation. There is also a disagreeable fold, corresponding to the outer angle of the eye, on that place where the upper and lower flaps have met. The tears make this place somewhat eczematous, causing a constant irritation.

It is, therefore, deemed advisable to do a second operation, particularly since the upper lid could stand somewhat of an en-



*Tom Jones*

Fig. 10.—1. Triangular cut, line of ectropion, and lines of incision. 2. Separation of conjunctiva corresponding to triangle outlined in 1. 3. Excision and suture of triangle. 4. Outline of flap to raise the depressed border of the outer portion of the upper lid. 5. Flap is turned 90 degrees and sutured to upper border. 6. Suture of the defect in the flap.



largement on its outer surface. The overlapping fold is cut down into the shape of a flap, and this flap is turned upward. A triangular piece of the conjunctiva with its base on the margin of the eyelid is cut out and the eyelid is drawn to the side, far enough to join the side of the defect caused by the flap. This does away with the ectropion by means of an old well-known method of ectropion plastic, called by the name of its author, the Kuhnt method. The flap of the fold is inserted into the upper eyelid and makes an admirable effect.

The result is almost perfect. The eye can be closed perfectly and with ease, the upper eyelid is movable, and the eyebrows have grown, only the hair must be clipped occasionally, as it becomes too long and too straight.

#### CASE II.—RECONSTRUCTION OF AN INJURED NOSE

This patient is thirty-five years of age. In 1918, while sawing lumber, a slab hit him on the nose, tearing the nose, face, and left eye. A doctor sewed it up immediately and the wound healed in about two weeks, but left the nose in a crushed condition, tilted up, with the eyelid everted, and scars running through the area. On the inner corner of the right eye is a fistula which discharges continually. The right and left sides of the nose are completely occluded.

In this condition the patient was referred to Dr. Joseph Beck, who, on June 10th under local anesthesia, broke up the atresia of the nostrils, dissected the skin over the septum from the frontal bone, and inserted two pieces of cartilage, which he had resected from the eighth rib, into the cavity, holding them in position by quilting sutures passed through the nose near the junction of the frontal bone. Into the nose he put splints.

Following the operation the patient, who was a rather weak individual, developed high temperature, with a great deal of irritation and suppuration on the right side of the chest from which the cartilages had been removed. This suppuration and temperature persisted until (on June 29th) a sequestrum was removed from the bridge of the nose. The chest wound discharged for some time, but was treated with success.

On July 29th the condition of the nose was about the same as when he arrived for treatment. The fistula in the right side of



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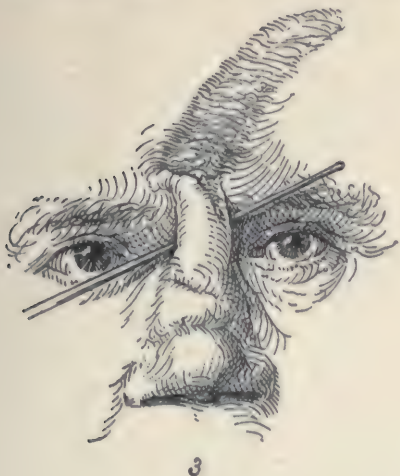
2

*Tom Jones*

Fig. 11.—1. Edges of flap at base approximated to diminish bloody surface and facilitate circulation. 2. Flap is sutured into the freshened surface of the bridge of the nose on three sides.

the bridge of the nose continued to discharge, and when he forced air into the nose and closed the nostrils the air came out

through the fistula, showing a communication with the nasal cavity. He was referred to our clinic on August 16th, and on



*Tom Jones*

4

Fig. 12.—3. Flap has adhered to its new base. The probe indicates the space left between the bridge of the nose and the pedicle. 4. The free side of the flap is sutured into the freshened bridge and the balance of the pedicle is spread out. The borders of the defect are freshened to ensure a covering for the defect.

September 1st a new plastic of the nose was made under ether anesthesia.



First, the entire scar over the bridge of the nose was resected, leaving a quadrangular defect. Two sides of the quadrangle ran longitudinally on the side of the nose, the other two sides were at the root and at the tip, running transversely. This quadrangle was cleared of every vestige of scar. Where the fistula communicated with the nose the tract was dissected. Then a tongue-shaped flap was dissected over the left eye, running directly upward and outward, with its pedicle directly over the

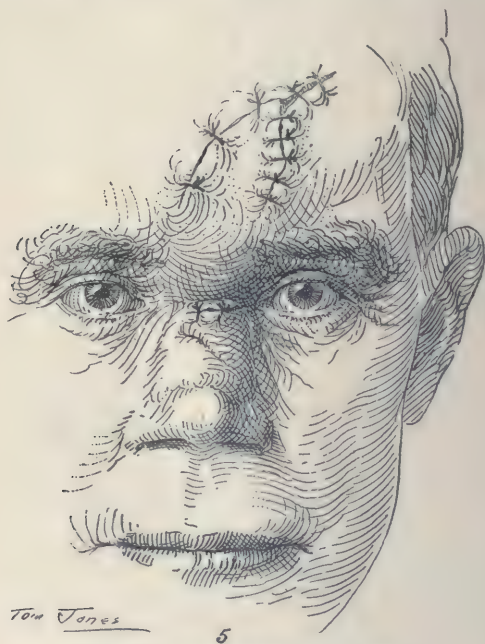


Fig. 13.—Flap sutured into place.

artery. This flap was turned down and fitted with the three sides into the quadrangle of the wound. Before it was stitched, however, a piece of bone cut in the shape of a cylinder with two sharp points at the ends was removed from the right tibia and inserted into the defect. A hole was tunneled into the bridge part of the defect and another into the tip part of the nose to receive the points of the bone. It was measured, so that when it was put into those holes it would not only form a bridge

of the nose, but would also keep the root and tip as far apart as possible, thus securing a straight instead of a saddle nose. Then the flap was sutured into the defect.



Fig. 14.—Photographs of Case II.

The patient made an absolutely good recovery with primary union of the wound. Two weeks later the bridge of the flap was

cut right at the root of the nose, the superfluous part of the flap drawn upward and backward into the diminished defect of the forehead, which by this time was granulating nicely, and sutured exactly into its former position, thus securing an intact forehead with only a few scars. The fourth line of the defect was now sutured closely into the cut side of the flap. It was somewhat bulky because it was much broader than it had to be, but this larger flap was made use of at a subsequent operation with great advantage in the treatment of the ectropion.

On September 14th, under local anesthesia, this last operation was performed. October 1st a new attempt was made to improve the condition. This time the ectropion was attacked. The cause of the ectropion was a scar corresponding to the lacrimal duct and gland, drawing the angle of the lid downward and exposing the conjunctiva. The operation consisted first in the removal of the scar tissue, which left a more or less oval defect of about  $\frac{1}{4}$  inch in width and  $\frac{1}{2}$  inch in length below the inner canthus of the eye. Great care was exercised to avoid cutting into the lacrimal gland. Since there was a bridge of healthy tissue alongside the flap in the nose, a part of this tissue had to be sacrificed in order to make use of the base of the Italian flap to cover the defect of the eyelid. A right-angled flap was cut loose and dissected on three sides from the nasal bridge and inserted into the defect of the eyelid on three sides, leaving the fourth side to a secondary operation.

Primary union took place, and the result of this operation is very satisfactory. The present condition of the patient is such that only a few small improvements have to be made, namely: Wherever the flap of the nose joins the nasal skin there is a scar which is somewhat retracted. It will be necessary to dissect this scar in order to make a better and more accurate union so that the lines of implantation of the flap are less marked. This will be done by the process of scar elimination. The other improvement necessary is to accurately join the lower eyelid to the flap taken from the nose.



## CASE III.—CONSTRUCTING A NEW NOSE

Mr. E. P., twenty-one years old, with a very interesting history of sickness from his early childhood. The mother died from some sort of throat trouble. When he was about one year old he had some kind of "breaking out" on his nose. He was taken to St. Louis for treatment, where the doctor used some very strong medicine which destroyed his nose.

The condition at this time when he was referred to my brother, Dr. Joseph Beck, for treatment was about as follows: The nose was missing from about an inch below the root and all the soft parts were gone and replaced by scars, which drew the upper lip upward, so that his mouth could not be closed. The nostrils were entirely gone and the communication between the outer and inner nose entirely suspended. Instead of the prominence there was a deep recess in the side view of the head, which demonstrated particularly the condition as it existed in the first operation.

On May 10, 1917, Dr. Joseph Beck made a first attempt at plastic. He loosened the skin around the edge of the scar, turned it upon itself with catgut sutures, thus forming the alæ or wings of the future nose. On May 21st, under general anesthesia, he made the second stage of the plastic, pulling down the remains of the columella and loosened the premaxillary spine. The left arm was then prepared and the skin and superficial fascia were loosened in the elbow region, the arm drawn across the face, and the loosened flaps sutured to the median part of the dissected wings of the nose. A plastic on the eyebrow was also done at this time. The patient was put in a plaster-of-Paris cast.

On May 31st the transplant was severed and sutured with three catgut stitches, but the graft over the eyebrow was necrotic. On June 2d a portion of the graft necrosed. There was some improvement in the condition, but the ultimate result was not very satisfactory.

On July 12th a third attempt was made. A V-shaped incision was made in the frontal region, the skin and subcutaneous

tissue dissected loose from the nasal bone, and the old scar and new graft loosened. A piece of bone was removed from the tibia and inserted into the nose in order to make a bridge. While the graft healed, the nose did not look satisfactory, and on August 6th another attempt was made to slide the nose downward, but it was a failure. On September 10th, under general anesthesia, another Italian plastic was performed to secure parts for the formation of a lip. This was partly successful, but the appearance at first was quite clumsy. The nose itself did not have any prominence, consequently another desperate attempt was made to produce a nose which would project more. On November 14th an Italian plastic was performed, using the little finger of the right hand to implant into the nose and holding it in position with a bronze wire. The hand was held in position by a plaster-of-Paris cast, but, unfortunately, the finger did not heal in, and had to be removed. On December 8th the patient developed a severe case of erysipelas which lasted for about a week, and from which he fully recovered.

January 14, 1918, the patient was given a morphin-scopolamin anesthesia and another attempt made to insert a finger into a pocket in the nose, holding it there by silver wire and adhesive plaster. This time the finger healed in and by January 24th was well anchored. The finger was now amputated in the middle of the second phalanx and held in position by three silk sutures. On January 31st, while the finger was fairly attached, some parts of it had become necrotic. On February 26th, under morphin-scopolamin anesthesia, a new attempt was made to make better use of the finger-tip. A place was made under the upper lip and the bone of the finger anchored to the bone of the maxilla with silkworm gut, which made a projecting septum. On March 26th the finger region was again exposed under morphin-scopolamin anesthesia and it was found that a portion of the transplant was projecting sharply. Now for the first time an attempt was made to punch out holes into the inner nose and connect the external nose with the internal, passing two rubber tubes through the same. In this condition, after a few more attempts were made to improve the general appearance,



Fig. 15.—Photographs of Case III.



the patient was left in charge of Dr. Carl Beck when Dr. Joseph Beck left for France.

To describe the condition in a few words I would say, we have a nose which looks like a diminutive organ with two openings into the inner nose, kept open with some difficulty, through which the patient can breathe for the first time in his life. There are no wings, no tip, and the upper lip is somewhat protruding. The eyebrow on the right side is missing and a scar is in its place. The whole region around the nose and on the forehead is scarred, but, fortunately, there is only a mild degree of keloid formation. There is not much projection of the nose. It is flat, but no longer receding, thanks to the implantation of tibial bone and finger. The finger seems to be acting very well as a septum and a good support.

I formed the following plan: The external nose will be used to make the internal lining and the new flap must be planted on it from the outside. The best place seems to me from the right forehead, but with its pedicle and its nutrition from the left side over the eye, so that the largest portion of the flap runs transversely across the forehead, the only area of healthy skin left on the same. At first I thought of making a sort of arm of this flap, implanted into the eyebrow, while the main flap would cover the nose, but I changed my mind and omitted this procedure.

On September 12th I performed the operation with the assistance of Dr. H. Pollock and Dr. Gardner. Under morphin-scopolamin anesthesia the first step was to cut the bridge transversely, then to cut on each side of the nose as far as possible within healthy tissue two incisions clear down into the region of the nasolabial fold. This right angular flap was dissected downward as far as possible and folded on itself in front to make a tip. The bridge was tunneled somewhat and into the tip was inserted a piece of bone,  $2\frac{1}{2}$  inches in length, taken from the tibia. There remained now a defect of a trapezoid form to be covered with the flap from the forehead. This was done and the forehead sutured as far as possible to diminish the defect by making a plastic sliding operation on the right extremity, in order to

reunite the borders of the breach made by the removal of the flap.

The patient made an uneventful recovery and everything healed by primary union. Fourteen days later the flap was cut off at its pedicle and the unused part of that pedicle was re-implanted accurately into its former position, covering the whole forehead now without difficulty and leaving no granulating surface. The nose looked beautiful, only it had no wings and no well-formed nostrils, and it was very large and bulky at the root and very flat at the tip.

The next step was to form wings. With some difficulty two flaps were obtained in the region of the nasolabial fold, formed like two claws running down toward the angle of the mouth, the wings of the nose dissected from the depth and covered by turning these two flaps toward the septum, uniting them in the center. Thus two very nice wings were formed and the patient's appearance considerably improved. The two nostrils are patent and the tubes running to the inner nose are in position and wide enough to allow fair breathing.

What remains to be done now is the diminishing of the root of the nose by excising a part of the superfluous tissue, at the same time implanting some cartilage into the tip to give it more prominence. The patient insists that he should have an eyebrow if possible. I shall, therefore, make an attempt to implant a border of the hairy portion of the scalp, as I have done before with success, after removing the scar of the eyebrow. This operation is really a very satisfactory one.

This last case teaches us that the difficulties of a plastic operation which appear sometimes insurmountable may be overcome by persistence, which is often harder to obtain on the part of the patient than on the part of the doctor.





## CLINIC OF DR. FRANK EDWARD SIMPSON

### COOK COUNTY HOSPITAL

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#### RADIUM IN MALIGNANT DISEASE. DEMONSTRATION OF 3 PATIENTS TREATED WITH RADIUM

*Summary:* Case I.—A case of epithelioma involving the base of the tongue (left side), the median glosso-epiglottic fold, and the left vallecula; macro- and microscopic diagnosis; insertion of three radium needles into the growth; clinical recovery.

Case II.—A case of carcinoma of the left lateral surface of the tongue; insertion of radium needles into the growth; clinical recovery; six months later metastasis to the submaxillary and submental glands of the neck; insertion of radium needles into the glands underneath the jaw combined with powerful surface application; clinical recovery.

Case III.—Epithelioma of the left lower eyelid, nose, cheek, and upper lip; clinical recovery under radium treatment.

#### CASE I.—CANCER OF BASE OF TONGUE AND EPIGLOTTIS

I TAKE particular pleasure in presenting this patient, now in perfect health clinically, because he represents a class of cases that were hopeless from every point of view prior to the advent of radium. It must not be supposed that success is invariable or even common in the majority of cases of this type. A successful outcome in cancer of the epiglottis is unusual, partly on account of the fact that the diagnosis is usually made late in the disease. In this case the original diagnosis of epithelioma was made from macroscopic inspection with a laryngeal mirror by Dr. J. Gordon Wilson. In order to obviate any doubt Dr. Wilson snipped off a minute piece of the growth for microscopic examination, thus confirming the diagnosis. The patient was then referred back to his family physician, Dr. Roy Sexton, of Streator, Ill., who brought him to me for radium treatment.

*History.*—Patient is a man aged fifty-three. He has been married thirty-two years and his children are healthy.

*Previous Illness.*—Childhood diseases only. Syphilis denied.

*Family History.*—No history of cancer or tuberculosis.

*Present Illness.*—Several months ago he noticed a little sore throat on swallowing. He felt as if something had stuck in his throat. There is no pain now, but he states that his tongue feels thick. His general health is good.

**Examination** (June 13, 1917).—Ordinary inspection showed nothing abnormal about the tongue and mouth. There were no enlarged glands to be felt in the neck.

*Examination of the Larynx* (Dr. Otto T. Freer).—An ulcerated area was seen involving the base of the tongue, the left vallecula, and the median glosso-epiglottic fold (Fig. 16, *a*).

While it would have been possible to apply a powerful radium tube to the interior of the throat, allowing it to rest in contact with the growth, it was thought best to attempt the introduction of my radium needles directly into the epithelioma. This was finally accomplished by means of indirect illumination, under local anesthesia, by Dr. Freer. Considerable difficulty was experienced in the introduction of the needles owing to the lack at that time of a proper instrument to hold the needle while introducing it. It was finally accomplished by using an ordinary needle-holder. We may digress for a moment to exhibit the present needle introducer and the radium needles.

The introducer (Fig. 16, *d*) was devised by Dr. Freer, and I have added to his model a lateral slot which allows of the easy disentanglement of the silk thread which is carried by the needle. The radium needles (Fig. 16, *e*), which I now exhibit, are of steel, 27 mm. long and 1.75 mm. in diameter, straight and round. The wall thickness is 0.35 mm. They are first gold-plated and then platinum-plated. These particular dimensions and form were chosen for the needles for special reasons. The needle is round instead of bayonet shaped so that it will if possible slip through the tissues and between the cells of the growth without cutting them. This, I believe, is less likely to lead to metastasis than would the use of three-cornered needles. The wall thickness of 0.35 mm. was chosen because, along with sufficient stability, this steel wall cuts off the alpha and softer beta

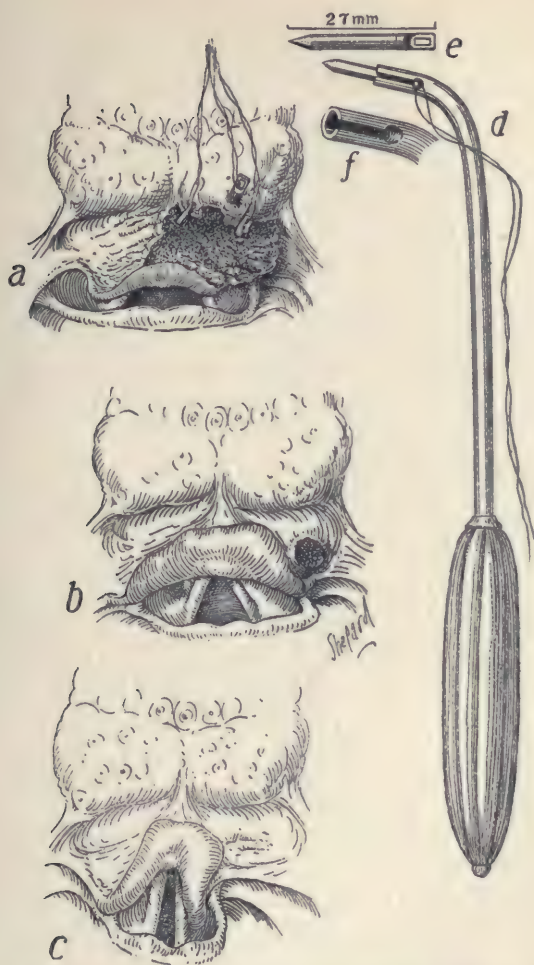


Fig. 16.—*a*. Drawing showing epithelioma involving the base of the tongue, epiglottis, and left vallecula. Three radium needles are seen buried in the epithelioma. This drawing was made June 13, 1917. *b*. Drawing showing effect of the radium. A small round ulceration in the left vallecula is seen. A perforation is seen in the epiglottis. This drawing was made August 28, 1917. *c*. Drawing showing complete healing of the epithelioma. The ulcer of the vallecula and the perforation of the epiglottis have disappeared. The epiglottis is drawn slightly to the left, probably by cicatricial retraction (December 7, 1917). *d*. Radium needle introducer with threaded needle in place. *e*. Detail of radium needle. *f*. Detail of needle introducer.



radium rays. The rays bombarding the tissues are, therefore, not too cauterizing, while the lethal dose to the tumor cells can be delivered in a shorter time than if the wall were thicker or composed, for instance, of platinum. One is thus enabled to deliver the proper dose in a reasonable length of time—not more than twelve hours. Each of these needles contains slightly more than 12 mg. of radium element, but it would be possible to put in slightly more radium or, of course, less. The radium salt (sulphate) is packed directly into the lumen of the needle, and the screw cap which contains the eye of the needle is then soldered on. After some experience with different strengths, the 12 mg. needles seem to be of a strength most generally useful.

Returning to our patient, the needles were left in position in the epithelioma (Fig. 16, *a*) for eight hours, and were then extracted.

On August 11, 1917, a marked change was seen in the growth. At the site of the epithelioma there was a round, depressed, sharply outlined ulcer with a white base. The left pharyngo-epiglottic fold was red and swollen. Although nearly two months had elapsed since the radium treatment, it was thought possibly that the appearances were due to radium reaction, and further treatment was not given.

August 28, 1917, examination showed the appearance seen in Fig. 16, *b*. A small round ulceration in the left vallecule was apparent, while the epiglottis disclosed a perforation. A white exudate (probably radium effect) covered the floor of each ulcer. The surface of the epiglottis was smooth. The sub-maxillary and cervical glands were not palpable. The patient complained of a good deal of pain in the throat.

On December 7, 1917, examination showed that complete healing had occurred. The radium exudate was gone and the ulcer of the vallecule and the perforation of the epiglottis had completely disappeared. The epiglottis was drawn slightly over to the left, evidently by the retraction of the cicatrix (Fig. 16, *c*). Pain had disappeared and speech and deglutition were normal. The patient had gained 35 pounds in weight.

At the present time (December, 1918) the patient still remains well.

### CASE II.—CANCER OF THE TONGUE

This case is unusual from every point of view. Cancer of the tongue is the "bête noir" of the surgeon and physician. Untreated, it always terminates fatally in from twelve to eighteen months, while either under surgery or radium the outlook is not promising except in its incipency. I have seen cancer of the tongue subside a number of times in striking fashion under radium, only to appear in the glands of the neck and progress sooner or later to a fatal termination in the majority of cases. A common and disastrous mistake is for cancer of the tongue to be mistaken for syphilis (gumma), especially if there is a history of syphilis. I have many times seen such a patient treated for syphilis and the diagnosis and treatment persisted in for months in spite of the fact that the patient was steadily getting worse. It is well to remember that syphilitic patients are prone to cancer of the tongue and that a positive Wassermann reaction does not exclude cancer, as a patient frequently may have both diseases. If a patient is treated vigorously by antisiphilitic remedies for even a few days and the suspected tongue lesion does not yield rapidly, cancer should at once be thought of, and surgery or, if inoperable, radium should be invoked. The clinical diagnosis is usually not difficult and rests on the following points:

While the cancerous ulcer is usually single and at the border of the tongue, and the syphilitic ulcer is often multiple and on the dorsum, the character of the *edge of the ulcer* is the most important single point. In cancer the edge is most frequently raised, nodular, and hard, while in the syphilitic ulcer the edge is usually undermined and seldom or never so deeply indurated.

I may also refer to the fact that the lymphatic glands of the neck are almost never involved in gummatous ulcer of the tongue, and almost invariably involved in cancer that has existed for several months. The diagnosis, however, ought never to be held in abeyance until enlargement of the glands

appear, as this means usually a hopeless outcome. Although the final diagnosis must rest on the microscope, the best surgical opinion is against the excision of a piece of the growth for microscopic diagnosis on account of the danger of opening up an avenue for the spreading of the growth through the lymphatics or blood-vessels.

*History.*—The patient presented today is a man aged fifty-three.

*Previous Illness.*—Has always been well. Syphilis denied.

*Family History.*—There is no history of syphilis, cancer, or tuberculosis.

*Present Illness.*—This patient was referred to me by Dr. F. N. Gaggin on May 1, 1917. He had noticed a sore spot on the left side of the tongue a month or two previously. He was a heavy smoker, and opposite the "sore spot" was the stub of a tooth.

**Examination** showed the appearances seen in Fig. 17, *a*. The lesion of the tongue was the size of a nickel, elevated about 5 mm. above the general surface of the tongue, red, circumscribed, slightly ulcerated, with hard and deeply infiltrated edges. There was no adenopathy to be made out in the adjacent glands of the neck. Operative removal of the tongue lesion was absolutely declined by the patient. On May 2, 1917, under gas anesthesia, I inserted 5 radium needles each containing 12 mg. of radium element into the borders of the growth. The needles were left in thirteen and one-half hours. A sharp reaction followed.

On May 18, 1917, a loose piece of dead tissue (radium slough), nearly the size of the epithelioma, was removed from the tongue.

On June 14, 1917, the patient received fifteen hours' treatment with 125 mg. radium element (2 mm. lead, 6 mm. non-metallic screen) applied externally below the angle of the left lower jaw along the anterior border of the sternomastoid muscle. At this point, you will recall, lie the upper deep cervical glands, which are by far the most commonly affected in cancer of the tongue. This treatment was given with the hope of affecting possible metastasis to the glands of this region.



On June 27, 1917, I decided to insert the radium needles again in the tongue. Under gas anesthesia six needles (12 mg. each) were inserted and left for twelve hours.

On September 28, 1917, the site of the epithelioma was depressed and a radiating, slightly puckered scar was left (Fig. 17, *b*). No gross metastases had appeared in the neck or elsewhere. The subsequent history of this case is interesting.

On January 3, 1918, about three months after apparent recovery from the tongue lesion, the patient appeared with evident metastatic trouble in the left submaxillary and submental glands, which had enlarged rather rapidly to the size of

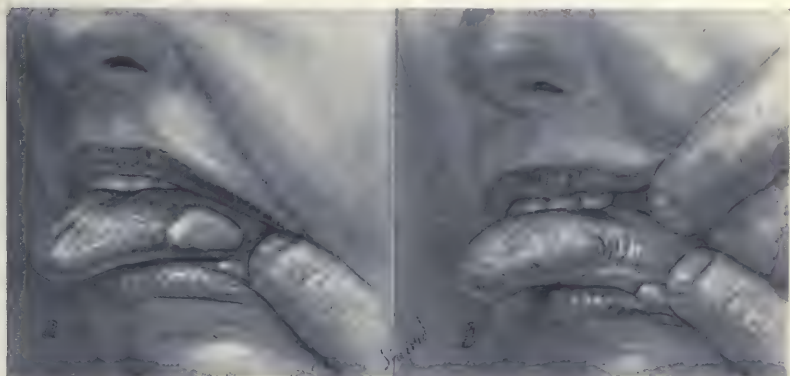


Fig. 17.—*a*, Carcinoma of left side of tongue, May 1, 1917; *b*, puckered depressed scar occupying site of former carcinoma, September 28, 1917.

an English walnut. On the same day I inserted under local anesthesia five radium needles (12 mg. each) into the submaxillary mass. The needles were removed in five hours. On the day following 200 mg. of radium were used over the submaxillary and submental glands for sixteen hours. In six weeks the glands had shrunk to a small and indistinct mass, hardly to be distinguished from the surrounding tissues.

The disease has remained quiescent to the present time (December, 1918), and to all appearances the patient is well, although I have thought it wise to give in the last few months a few prophylactic radiations over the neck. In the last six

months the patient has gained 18 pounds. The appearance of the tongue has not changed for over a year and the neck is normal to palpation.

In commenting on this case it must be emphasized that no claim is made as to the permanence or even completeness of this patient's recovery.

Cancer of the tongue is always of the squamous-celled type. It is the most likely of all cancers to invade the lymphatic glands early and widely, and this in itself precludes success in most cases. Early diagnosis insures an increased hope of recovery. The case shown here today simply illustrates the palliative value of radium in certain cases that are for any reason inoperable.

### CASE III.—EPITHELIOMA OF THE FACE

This patient illustrates the great value of radium in very extensive basal-celled epitheliomas of the face. This type of epithelioma is of very slow growth, the one presented here today having been present for more than six years. I have repeatedly seen epitheliomas of more than ten years' duration which were strictly confined to a circumscribed area in the skin.

The clinical diagnosis of epithelioma of the skin is usually not difficult. The patient's age (usually, but by no means always, past forty), the beginning as a small scurvy spot, a wartlike excrescence, or minute nodule, which itches slightly and tends after a time to scab, crack, and bleed—all these are suggestive of cancer. Later, distinct ulceration is present and the border of the ulcer almost invariably shows a peculiar raised and hard edge.

Once the clinical diagnosis of epithelioma is established, it is of considerable importance from the standpoint of treatment to determine the pathologic type of cancer, especially as to whether the growth is of basal-celled or squamous-celled type. Unfortunately, there is no certain method of distinguishing the two except by microscopic examination. A probable diagnosis of the type can usually be made clinically, however, and rests on the following points:

First: Its location. Epitheliomas of the face, especially

when on the upper two-thirds of the face and away from the mucous membrane, are usually of the basal-celled type. This type is also common on the shoulders and upper part of the trunk. Fully one-half of the epitheliomas of the upper lip are also of the basal-celled type.

Epitheliomas of the tongue, lower lip, penis, and extremities are commonly of the squamous-celled type. There is no absolute rule, however, holding in all cases.

Second: A papillomatous aspect to the growth usually means a squamous-celled cancer.

Third: The rate of growth. Basal-celled cancer grows slowly, and the existence for several years of an epithelioma on the upper half of the face not larger than a silver dollar and away from the mucous membranes means almost certainly a basal-celled cancer. Squamous-celled cancers grow more rapidly and may attain considerable size in a few months.

Fourth: The presence or absence of metastases. Basal-celled epitheliomas are said never to metastasize, and if one apparently does invade the lymphatic glands late in the disease, it is because a squamous-celled growth complicates it.

Squamous-celled cancer metastasizes early—often within a few months of the onset. It is very regrettable that so many cases appear with metastases already present. While this clinches the diagnosis, it adds immeasurably to the gravity of the prognosis.

The problem of treatment hinges largely on the type of growth that is present.

(a) With *squamous-celled cancer*, if the case is considered operable by the conservative surgeon, the draining lymphatic glands and growth should be excised "en bloc." With an early diagnosis, permanent recovery should be brought about in 95 per cent. of the cases. If, in addition to operation, post-operative prophylactic radiations with radium can be carried out, it seems probable that even a higher percentage of freedom from recurrence can be secured.

With inoperable cases the growth may be held in abeyance at times for a considerable period, and it is even possible to bring about clinical recovery in some cases by means of radium.



(b) For dealing with *basal-celled epitheliomas* radium, properly applied, is perhaps the most satisfactory agent we possess, and sometimes succeeds when everything else has failed.

Recovery is usually prompt under radium, while the cosmetic result is often very excellent, especially when too great destruction has not already been caused by the cancer itself.

*History.*—The patient whom I now show is a woman aged fifty. She was referred to me through the kindness of Dr. N. W. Abell.



Fig. 18.—*a*, Epithelioma of the left lower eyelid, nose, cheek, and upper lip. Photograph taken June 15, 1918; *b*, showing healed epithelioma. Photograph taken August 15, 1918.

*Previous Illness.*—Has always been well.

*Family History.*—Nothing of importance appears in the history. There is no history of cancer.

*Present Illness.*—The growth which we see in this patient's face began about six years ago as a small spot (senile keratosis) on the left side of the nose. Very slowly the disease spread, and with various periods of crusting, ulceration, and bleeding finally

assumed the form seen in the photograph (Fig. 18, *a*) which was taken June 15, 1918.

The method of treatment carried out in this patient shows the powerful selective action possessed by radium, especially when an almost pure gamma ray is used. In the technic of treatment it is important to protect the eyes and hair. In this case the eye was shielded by a special gold screen. 8 mm thick. The eyebrow was protected by 4 mm. of lead. Another point of the greatest importance in the treatment of these cases is to have at one's command a sufficient quantity of radium.

In this case 200 mg. of radium element screened with 1 mm. of silver and 4 mm. of non-metallic substances (rubber and wood) were applied to the epithelioma, so that an even distribution of the radium rays was obtained over the entire growth. Between June 15th and August 6, 1918, a total of twenty-five hours was given in séances of one and one-half to three and one-half hours each. In the course of eight weeks the epithelioma completely disappeared without the appearance of any inflammatory reaction, and on August 15th this photograph (Fig. 18, *b*) was taken, showing the complete healing of the growth.

The patient appears now (December, 1918) entirely well, and we may confidently predict that a recurrence is very unlikely.





## CLINIC OF DR. ARTHUR DEAN BEVAN

### PRESBYTERIAN HOSPITAL

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## OBSTRUCTION OF THE ILEUM DUE TO TUBERCULOUS ULCERATIONS

*Summary:* Chronic intestinal obstruction of insidious onset; probable diagnosis; *x*-ray findings; operation—pathologic condition—technic employed; discussion of ileocecal tuberculosis.

*December 10, 1918.*

THE case which I shall first operate on this morning is a patient of Dr. Bertram W. Sippy. Dr. Sippy has had him under observation for some days, and has made a diagnosis of an obstruction probably in the lower portion of the ileum. The patient has until the last few months had very good health. There has been no history of any previous abdominal lesion of any kind. Gradually, without any acute symptoms, there has developed a condition of chronic obstruction with very visible peristalsis, without any constitutional evidences of infection as shown by increased temperature. There has been some loss in weight. When Dr. Sippy first saw the case he was inclined to regard the marked peristalsis and distention as due to either an obstruction in the large bowel or possibly an obstruction at the pylorus. Both of these, however, were ruled out by careful *x*-ray examination. The barium meal taken into the stomach showed a normal stomach and a normal duodenal cap, and the barium injections into the colon showed a normal condition of the entire large bowel. Some hours after the barium meal was introduced into the stomach the patient was given another *x*-ray examination and a very marked dilatation of the small intestine was found, and from the location and greatly distended loops was probably in the lower ileum. The clinical diagnosis, therefore, is obstruction in the lower portion of the small intestine from some unknown cause.

The patient is now anesthetized and I shall make a large muscle-splitting incision such as we make for an appendix lesion. I have employed this type of incision a good many times in cases that I have operated on for obstruction in the ileum and in the cecum. On opening the peritoneal cavity I find first a normal cecum coming into view. The appendix is also normal, but alongside of this cecum we can see this very greatly distended loop of ileum, expanded to a size considerably greater than that of the large intestine. Drawing out this distended loop I find about 16 or 18 inches from the ileocecal valve a definite lesion in the ileum, a constriction of the gut at this point which seems to be quite complete. This constriction is covered with edematous lymph, and on the surface are nodules that are consistent with being the tubercles characteristic of tuberculosis. It is evident that this lesion involves the entire thickness of the intestinal wall and that it produces a very distinct and almost complete obstruction at this point. It is possible that there may be other similar lesions, as my experience has been that in these tuberculous lesions involving the ileum they are apt to be multiple, and on this account I shall examine carefully the entire ileum. Drawing out more of the ileum I find 8 or 10 inches from the first lesion a second lesion of the same type, and, continuing my search, I find a third lesion. You will see that I have now drawn out 6 or 8 feet of the small intestine and that the three lesions found occupy a space of about 25 to 30 inches. It will be necessary, therefore, for me to resect that portion of the bowel including these three distinct tuberculous strictures. We could, of course, sidetrack this loop by an anastomosis, but such a procedure would be, I am sure, not advisable, because our experience has been in these cases of intestinal tuberculosis that the sidetracking operations have not been very satisfactory, and I would not consider it in this case at all, because the patient is in very good general condition and, I think, will safely stand the radical operation of resection. I shall make here not an end-to-end anastomosis, but a side-to-side anastomosis, and I will ask you to follow the technic which we shall employ.

I shall place at a distance of about 3 inches from the lesion

nearest the cecum a heavy crushing forceps on the ileum. I leave this on for a few moments and then ligate with a strong silk ligature at the point of crushing of the bowel. I do the same thing about 3 inches proximal to the proximal lesion in the ileum (Fig. 19, *a, b*). I shall then ligate the mesentery of this involved loop with ligatures of catgut. I now place the clamp about an inch from the point of ligation and divide the bowel close to the ligature, leaving simply enough of the stump to keep the ligature well in place. I now, by dividing the mesentery and dividing the bowel at the other end, remove the entire loop including these three lesions in one piece. I shall now invaginate the stump of each end of the ileum with purse-string sutures. I employ linen for this purpose, and you will notice that I invaginate a considerable amount of the end of the ileum, probably  $\frac{3}{4}$  inch, in the first purse-string, and in the second purse-string suture probably  $\frac{1}{2}$  inch (Fig. 19, *c*). This makes a very complete closure of each end of the bowel. I then make a lateral anastomosis just as we would in a gastro-enterostomy, employing three layers of suture, one for the mucosa, one for the muscularis and peritoneum, and finally a Lembert (Fig. 19, *d*). I now close with fine catgut the irregular opening in the mesentery so as to prevent any possible internal strangulation by a loop of intestine falling in between the intestine and this mesenteric opening. This side-to-side anastomosis is rather time consuming. At the same time, in my own work and from the experience in other clinics, I think it is much safer than an end-to-end anastomosis in a case of this kind. I believe that that is true in making an anastomosis of the small intestine, and it is certainly true in an anastomosis of the large intestine where an end-to-end anastomosis is extremely difficult. I shall close the external wound, leaving in a small cigarette drain down to the point of anastomosis. This we shall remove, if everything is satisfactory, at the end of forty-eight to seventy-two hours.

In regard to the after-management of the case I think it would be well to give the patient a moderate amount of fluid per rectum for several days, say about 8 ounces every three hours. At the end of twenty-four hours, if there is no vomiting,



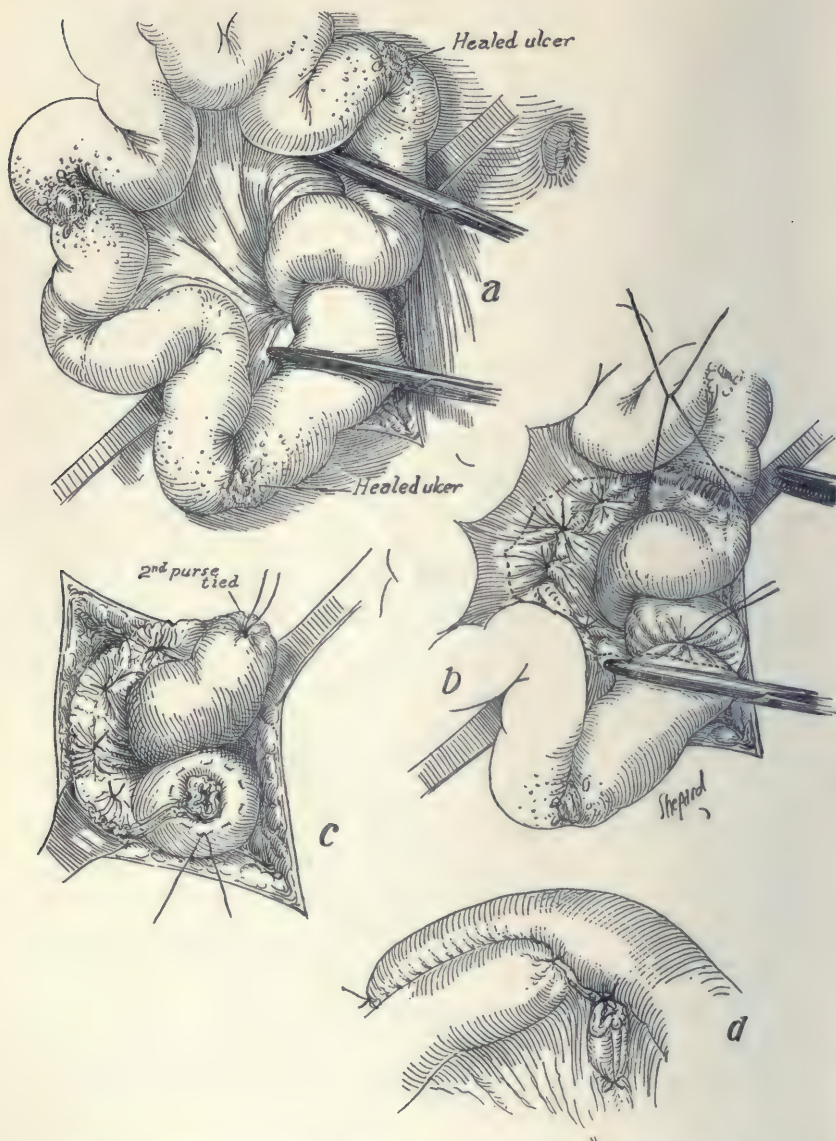


Fig. 19.—Obstruction of the ileum due to tuberculous ulceration: *a*, Ileum to be resected clamped off; *b*, crushing clamps removed; ileum and mesentery ligated. Dotted line indicates line of resection; *c*, invagination of stump with purse-string sutures; *d*, side-to-side anastomosis of ileum. Opening in mesentery closed.

I would give the patient water, then broth, and then milk by the stomach.

Examination of the gross specimen shows a healed tuberculous ulcer at each of these three points. At each of the points the healing made a stenosis. This, of course, has not been complete, but the stenosis is so marked that only quite liquid intestinal contents could pass through. Fortunately, of course, in the small intestine the intestinal contents are liquid. A stenosis of the large intestine of this character would have long ago proved fatal because of the consistency of the contents of the large intestine. A careful histologic examination of these lesions will be made to determine absolutely the pathology.

This case comes under the general group of cases to which we have applied the term "ileocecal tuberculosis," and, although in this particular case the lesion is limited to the ileum and does not involve the cecum, very frequently both cecum and ileum are involved. In these cases the lesion begins in the mucosa or submucosa of the bowel and extends to the other coats of the bowel, and later to the draining mesenteric glands, and, to a limited extent, to the peritoneum. The condition differs very markedly from the cases which come properly under the group known as "tuberculous peritonitis." In typical tuberculous peritonitis the lesion is necessarily hematogenous. In these cases of ileocecal tuberculosis, although the lesion may be hematogenous, we would have to admit also the possibility of a direct infection of the mucosa from food or the contents of the intestine. Possibly we would have to admit of the possibility of a direct infection of this portion of the bowel from tubercle bacilli in the milk or in other articles of food, and we would have to recognize the possibility of infection by tubercle bacilli coming from a focus higher up, as a lung tuberculosis with an infection of the intestine from swallowing sputum containing tubercle bacilli and their localization and development in the mucous membrane of this portion of the intestinal tract.

In the general handling of one of these cases it is fair to assume that these lesions are not necessarily the only lesions of tuberculosis in the individual. On that account the patient

should be given the benefit of the hygienic treatment that is usually adopted for general tuberculosis or lung tuberculosis. I think it would be wise to have this young man live in some climate where he can be outdoors the greater part of the year, and to make it for a long period of time the most important duty of his life to build up his resistance against a possible extension of the tuberculous process. One can be sure that we have not eliminated and removed at this operation all of the tuberculous disease in this patient, because I found a pretty general enlargement for some distance of the mesenteric glands, not only those mesenteric glands that drain this particular loop of bowel, but the mesenteric glands some distance away. I think, therefore, it would be very possible with the building up of his resistance that he would make a complete recovery from this condition.

In discussing the surgical therapy of these cases of ileocecal tuberculosis I would like to emphasize the importance of doing here first the radical operation rather than a palliative operation of sidetracking the lesion. It is true that in some cases the condition of the patient is such as to make it impossible to do such a radical operation as we have done this morning in this case. This is particularly true in the presence of obstructive symptoms which demand immediate relief in order to save the life of the patient. We have in such cases done an anastomosis between the two sound loops of the intestine above and below the site of the lesion, and have secured a good deal of temporary benefit. The benefit, however, is not as complete and the prospect of cure is certainly not nearly as good as where we do the radical removal of the gross lesion. I am rather inclined to urge at least the serious consideration of the radical removal of the gross lesion in those cases where a palliative operation of anastomosis has been done, even though it has secured marked improvement, the radical operation, of course, being left to a time when the condition of the patient warrants such a step.



## INJURIES OF THE SHOULDER-JOINT

*Summary* : Two cases of injury to the shoulder-joint. Case I.—An extensive comminuted fracture of the shaft of the humerus and a dislocation of the shoulder-joint; unsuccessful attempt at reduction without open operation; open operation—reduction by Gunn's method and application of Parham bands; history of Gunn's method; after-history of case.

Case II.—A transverse fracture of the anatomic neck of the humerus with marked displacement of the fragments; treatment by open operation—fragments held in position by means of iodine catgut; after-history.

*November 6, 1918.*

I SHALL present to you this morning two injuries of the shoulder-joint. The first patient is a man of thirty-five, a carpenter, who fell a distance of about 16 feet among some beams

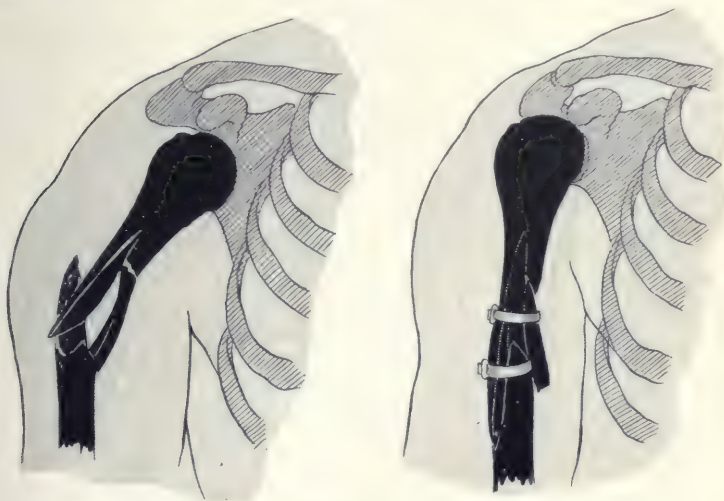


Fig. 20.—Fracture of humerus and dislocation of shoulder-joint.

and sustained a very severe injury of the right arm and shoulder. The *x-ray* picture (Fig. 20) shows an extensive comminuted fracture of the shaft of the humerus and a dislocation of the shoulder-joint. The injury is not compound.

When he came here two days ago I attempted to handle it without doing an open operation. I thought that I had reduced the dislocation of the shoulder and had secured a very good reduction of the fracture of the humerus. I placed it in a light plaster cast. The next day I had another *x*-ray picture taken and found that we had not succeeded in reducing the dislocation. It will be necessary this morning to anesthetize him and make an open operation, which I shall do under drop-ether anesthesia.

You can see from the *x*-ray picture the middle third of the shaft of the humerus broken into four or five fragments and greatly displaced. Fortunately, there is no evidence of any injury of the musculospiral nerve, as the man has no drop-wrist and no sensory paralysis. The dislocation of the shoulder is the usual subcoracoid dislocation.

The patient is now etherized and the field of operation has been prepared in the usual way. I shall make an incision over the fracture a little above the center of the humerus on the outer surface, taking care to avoid injury to the musculospiral nerve. As I open down to the site of fracture I find a large amount of coagulated blood, which I mop out with a sponge. The first problem to be treated is that of the reduction of the dislocation.

I now expose the lower end of the upper fragment and drill a good-sized hole through it with a bone drill. I pass through this hole a very large-sized piece of heavy copper wire about 1 foot in length. The ends of the wire are now twisted together firmly, so as to make a loop with which I can exert the necessary amount of traction in reducing the dislocation. In order to secure a good purchase I place several thicknesses of gauze in the loop of wire, so that I can make strong traction without cutting my rubber gloves or injuring my hands with the wire loop. I shall reduce this dislocation by the method which was taught by Moses Gunn, who deserves more credit for our accurate knowledge of the mechanism of a dislocation than anyone else I know. Gunn, as early as 1853, made a special study of the mechanism of dislocation, especially of the hip and shoulder. This was

shortly after the introduction of anesthetics, and Gunn's course of reasoning was something as follows:

Up to that time muscular contraction had been regarded as the main obstacle to the reduction of a dislocation, but with the introduction of anesthetics this factor could be eliminated by producing complete relaxation of the muscles. Gunn's attention was at once called to this fact, and he asked himself the question, If the important factor preventing reduction of a dislocation is not muscular contraction, then what is? And he sought to find the answer. He made a number of dissections on the cadaver, removing the muscles about the shoulder-joint and hip-joint, leaving the ligaments intact. He would then produce a dislocation and study his specimen to ascertain what factor prevented easy reduction by manipulation. It at once became evident that when one makes a dislocation of the shoulder in a specimen of this kind and attempts by direct traction to reduce the dislocation, the untorn portion of the capsular ligament at once becomes very tense, and the stronger one pulls on the upper extremity, let us say directly downward, the more tense this untorn portion of the capsular ligament becomes. Gunn therefore formulated a rule that the most important factor in preventing the reduction of a dislocation by manipulation was the untorn portion of the capsular ligament. He followed this with a second proposition that, in order to reduce a dislocation by manipulation, one should relax that untorn portion of the capsular ligament; and with a third rule, that in order to accomplish this the limb should be placed in the position it occupied at the moment of escape, and we should reverse the force which had produced the dislocation. Applying these principles to dislocations of the shoulder-joint, knowing that in almost all cases the portion of the joint capsule that is torn is the inferior portion, we should adopt the following scheme of manipulation: Elevate the arm from the side almost in a vertical position. This relaxes completely the untorn portion of the capsule. Then make direct extension on the arm and have the assistant make counterextension by holding the thorax firmly on the table. The surgeon then should gradually, while extension is being



applied, swing the arm down from the vertical position to a position almost parallel with the body, and at the same time the assistant who is holding the thorax firmly on the table should make counterpressure on the head of the humerus to replace it in the axilla. Almost invariably this manipulation is successful and very easily successful if it is properly carried out, at least in recent dislocations. Personally, I believe it is a much better method of reduction than the Kocher method of reducing dislocations of the shoulder. I believe that it is more often successful and that it carries much less risk than does the Kocher method. There is no rotation of the humerus and there is less risk of fracture of the humerus or of injury of the brachial plexus. The patient should be, as a rule, of course, under an anesthetic. Personally, I prefer gas anesthesia, which suffices, or a very brief drop-ether anesthesia. In some very powerful muscular subjects complete relaxation is necessary, and this can only be obtained by full ether anesthesia.

Following out these rules of Gunn in this case, I have one assistant fix the thorax firmly on the table and another assistant carries the broken arm up to an almost vertical position, and at the same time I carry the upper fragment, through which I have placed this strong wire, also into that vertical position, making direct traction, and with a little counterpressure on the head of the humerus the dislocation is readily reduced. I would ordinarily be perfectly satisfied to handle a fracture of the humerus, such as we find in this patient, without doing an open operation, but inasmuch as we have to make an open operation to secure reduction of the head of the humerus I am going to use a Parham band on this badly comminuted fracture to bring the fragments more accurately into position. This Parham band was introduced by Dr. Parham, of New Orleans, some years ago, and I have found it very useful in oblique fractures of the long bones, especially the humerus, femur, and tibia, and it seems as though it would be the best mechanical means of handling this particular fracture. I pass around some of these Parham bands for your inspection, and the instrument with which they are applied. It is made of a very tough steel, which does

not easily break. It necessitates freeing the entire circumference of the bone for a small area, about  $\frac{1}{3}$  or  $\frac{1}{2}$  inch, so the band can be passed entirely around these fragments. I find that it is difficult to get a very good approximation with this first band as I tighten it, and, although I dislike to do so, it will



Fig. 21.—Cast used in reducing fracture of humerus.

be necessary for me to introduce a second band in order to bring these fragments into a satisfactory position. I now introduce a second band in the same manner. I make a closure of the incision by some deep fine catgut sutures and close the skin incision with black silk, and place the shoulder and entire upper extremity in a plaster-of-Paris cast (Fig. 21).

**After-history.**—This man went on to a good recovery. The x-ray plates (Fig. 20) show a reduction of the shoulder dislocation and the two Parham bands in place on the humerus. The humerus united very satisfactorily with a little watery discharge for several weeks in the center of the wound, although no evidence of infection. It may be necessary later to remove under local anesthesia these Parham bands, and I should not hesitate to do so if the slight discharge does not entirely cease within a short time. The patient had for a time a rather marked atrophy of the deltoid, but no paralysis. Fortunately, this proved simply to be the atrophy of disuse, which is gradually disappearing under exercise.

I would like to emphasize a few points in connection with this case, because this problem of fracture of the humerus and dislocation of the shoulder is a complicated and difficult one to handle. Some years ago Dr. Charles McBurney wrote a very excellent article on this subject, and recommended the open operation, drilling a hole in the lower end of the upper fragment large enough to introduce a large hook, very much like a beef-hook, and using this hook for traction required to reduce the dislocation. I adopted McBurney's suggestion on several occasions. I have found, however, that the plan which we used in this case, namely, the use of a heavy piece of wire, is very much easier and more satisfactory than the use of the hook. With a loop of heavy wire one can obtain very much better traction than with the hook, and a hole drilled in the bone can be made very much easier and very much smaller.

The second point I should like to emphasize is the really great value of the Parham band in these oblique fractures.

**CASE II.**—The second case which I shall present to you this morning is another shoulder case, which was brought into my service yesterday. A farmer fell about 13 feet from a hayrack and sustained a severe injury to the shoulder-joint. He was seen by several very good medical men, who anesthetized him and worked over the shoulder for about an hour, attempting to reduce the displacement. He comes here with an enormous hematoma about the left shoulder-joint. It would be impossible



for me to make an accurate diagnosis here in this greatly swollen area without the use of the x-ray. The x-ray (Fig. 22) shows a very clean transverse fracture of the anatomic neck of the humerus with marked displacement of the fragments. The upper end of the lower fragment projects into the axilla, very much as we find the head of the humerus in a shoulder-joint dislocation.

I ordinarily treat these cases without an open operation. I think, however, with this marked displacement and with this large amount of blood-clot thrown out about the injury, it will be better to make an open operation and remove the blood-clot and sew the fragments together.

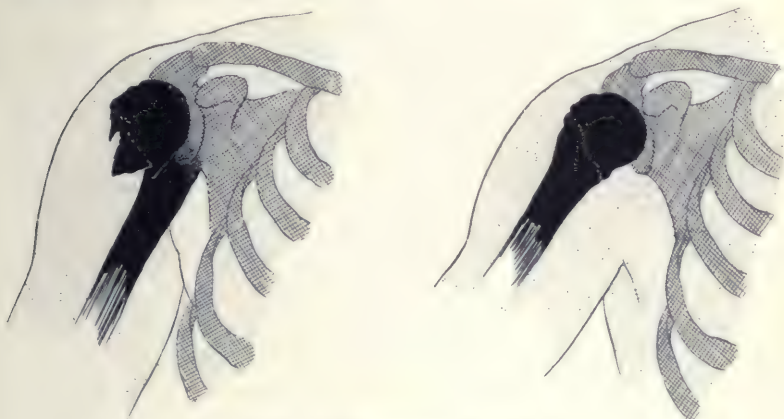


Fig. 22.—x-Ray tracing of Case II.

Under ether anesthesia an incision 5 inches in length is made through the anterior portion of the deltoid down to the fracture. You see what a large amount of blood-clot and liquid blood we are turning out from around this injury. The transverse fracture is readily found, the upper fragment first coming into view, and then, while very gently making extension and rotation, the upper end of the lower fragment is brought into the wound. The upper fragment is drawn well out from it and it is difficult for me to place it into any position. It will therefore be necessary for me to bring the lower fragment out and abduct the entire arm in order to place both fragments in the same axis. As I

abduct it well out from the body—about 45 degrees from the body—you will see that the fragment comes very accurately into position (Fig. 22). With a small bone-drill I now drill a hole first in the upper and then in the lower fragments, and use some medium-sized strong iodine catgut and sew the fragments together. I shall introduce a second one about  $1\frac{1}{2}$  inches from this first so as to be sure to secure accurate apposition. The arm is now dressed in this abducted position and held there by an extensive plaster-of-Paris dressing.

**After-history.**—At the end of ten days the stitches were removed and wound healing was found complete. The arm was left in this abducted position for about three weeks. Then the cast was removed and the arm simply put in a sling, and the case went on to a very complete recovery, of course, with the usual atrophy of disuse that is necessarily associated with these cases, but which disappears entirely after union is complete and the limb is exercised for a few weeks.

## TREATMENT OF INTESTINAL FISTULA BY MEANS OF BISMUTH PASTE

*Summary* : Patient giving a history of long-continued stomach distress, followed by an acute attack of pain in the right upper quadrant and later the formation of an abscess; operation followed by a duodenal fistula; treatment with bismuth paste—closure; return of ulcer symptoms some months later accompanied by a marked retention of stomach contents; exploratory operation—ulcer of duodenum about to perforate; treatment—inversion of ulcer and posterior gastro-enterostomy; necessity for surgical therapy in cases of duodenal ulcer with complications; use of bismuth paste to control leakage from intestines and duodenum; demonstration of its use in two cases, one a gangrenous appendix with abscess and gangrene of the cecum; the other a neglected appendicitis with an abscess between rectum and bladder.

*November 14, 1918.*

I WANT to present to you this morning a patient who has the following history:

He is a man of twenty-seven, who has had for several years stomach distress, but not very severe. Then he developed a severe pain in the right upper quadrant of the abdomen, which put him to bed. A physician was called, who took charge of the case. The diagnosis was uncertain for some time. At the end of ten days or two weeks an abscess developed in the right upper quadrant of the abdomen, which was operated upon and drained. Considerable pus was found when the peritoneal cavity was opened. The exact cause of the abscess was not evident at first, but the operation was followed by a discharge of stomach contents or duodenal contents into the abscess cavity and out through the external drainage that had been provided, making it practically certain that he had a subacute perforation of the duodenum with an abscess around the site of perforation, which was walled off by a plastic peritonitis. The acute symptoms subsided after operation and there remained simply a fistula into the duodenum. This was treated with thick bismuth paste, and, fortunately, the opening in the bowel closed and the patient went on to a good operative recovery. His general condition



improved and he was in fairly good health for a number of months.

Lately the old symptoms of duodenal ulcer have recurred, the hunger pains coming on two or three hours after eating and relieved by soda or food taking. I have had him in the hospital for several days under observation and find that he has a marked retention of about 250 c.c. of food at the end of seven hours.

Taking the gross facts into consideration in this case, that he had this perforating duodenal ulcer with abscess and now has retention, I have without any hesitation urged an operation, and I shall do, depending upon the conditions that we find at the time of the exploratory, either a resection of the ulcer or a gastro-enterostomy.

The patient is now anesthetized. You will notice that the incision of the first operation is about  $2\frac{1}{2}$  inches from the midline over the outer portion of the rectus muscle. I shall not open the abdomen through this old scar, but shall make a midline incision. Opening into the peritoneal cavity I come first down to the stomach, and as I attempt to pull it into view, there are quite firm adhesions found, binding it down to the anterior abdominal wall. I clamp these off, divide between, and ligate them. Retracting the edges of the incision with blunt retractors I bring into view the pyloric end of the stomach and duodenum, and there is here, as you see, beautifully exposed (Fig. 23, *a*) an ulcer of the duodenum on its anterior surface, which is just about ready to perforate. There is simply a gray gelatinous substance covering the floor of the ulcer and preventing the escape of intestinal contents into the peritoneal cavity. The ulcer, as you see, is a little irregular in shape and about the size of an ordinary bean. There is a good deal of dense induration about the first part of the duodenum and pylorus, making a very definite obstruction and accounting for the clinical findings of the stomach not emptying itself at the end of seven hours.

I shall not resect this ulcer, because it would be mechanically difficult to resect it and to obtain a good-sized caliber extending from the stomach into the duodenum. I shall, therefore, invert this ulcer that is almost ready to perforate, first with a continuous

Lembert suture of Pagenstecher linen, and over this I am now placing a fine catgut suture (Fig. 23, *b*). This will compromise very greatly the caliber of the pylorus and duodenum at this point, which, however, is something to be desired in this case. I shall now do a typical posterior gastro-enterostomy.

I pick up the omentum and transverse colon and draw them well out of the incision, exposing the posterior surface of the

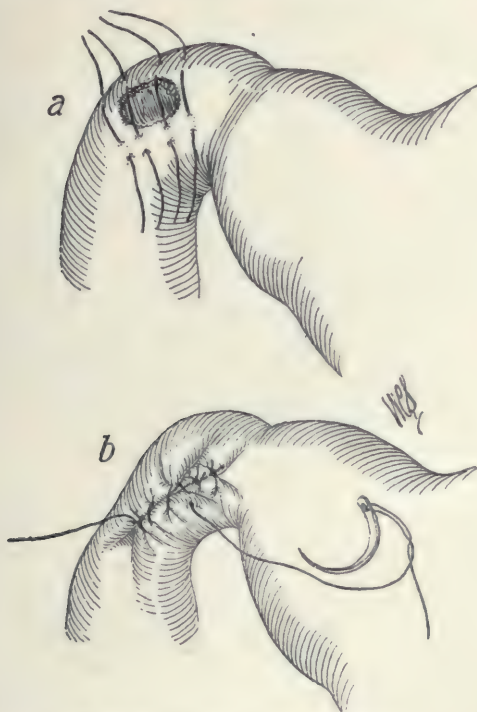


Fig. 23.—Inversion of pyloric ulcer.

stomach covered by the transverse mesocolon. I select an avascular point of this transverse mesocolon and make an opening in it with a closed pair of artery forceps. I stretch this opening into a good-sized tear, large enough to admit my two fingers. Out of this I draw the posterior surface of the stomach and place a clamp protected with rubber tubing on the stomach. I now pick up the first part of the jejunum and with a very short loop

I make a posterior gastro-enterostomy (Fig. 24), using three rows of sutures, which I always do in these cases, just as did Billroth in his early stomach and intestinal work—one row a Lembert, which draws the jejunum and stomach together. I then make an incision through the peritoneum and muscularis,

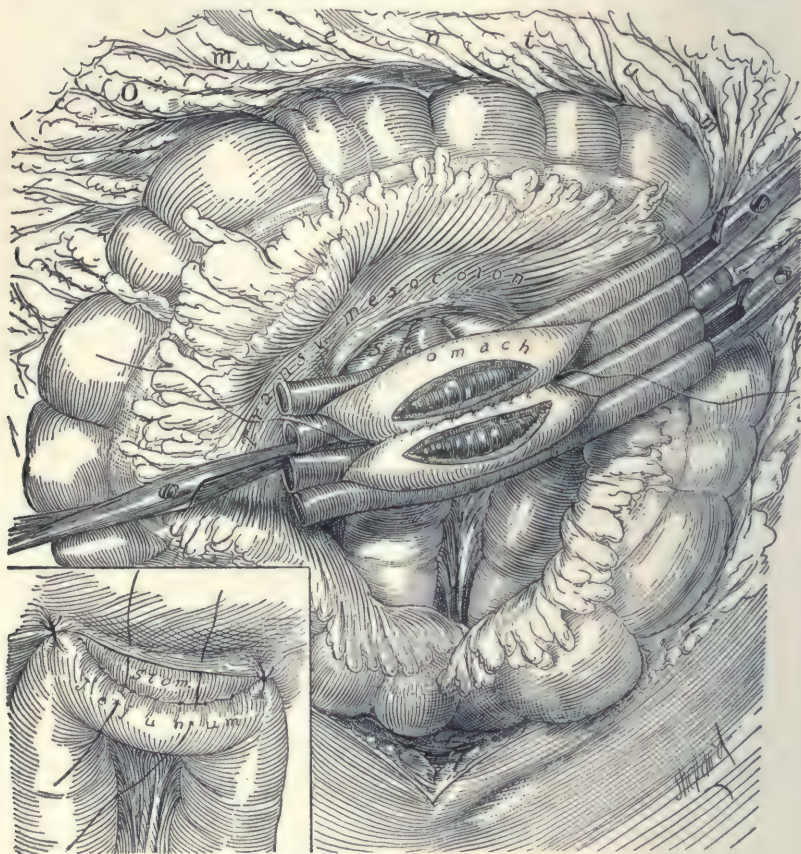


Fig. 24.—Posterior gastro-enterostomy.

but not through the mucosa, parallel with the line of sutures. A second row of sutures is inserted, picking up this flap of peritoneum and muscularis. The mucous membrane is now incised and a third row is used to suture the mucous membrane of the intestine and stomach together. This completes the posterior half of the anastomosis. Now, beginning with the last row of



sutures, namely, the one through the mucosa, I complete the anterior half of the suturing. You will notice that before I make my final Lembert on the anterior surface I remove the clamps. I always do this because we can make a more accurate suturing with the clamps removed, and we can determine whether the first two rows have succeeded in completely controlling the hemorrhage and have made water-tight the ends by the anastomosis. The gastro-enterostomy is completed by taking three or four fine catgut sutures between the intestine and the opening in the transverse mesocolon. This is an essential feature and is one that should not be neglected. One of my colleagues told me recently that inside of a year he has had 3 cases of obstruction of the bowel in gastro-enterostomy due to the intestine becoming strangulated in the opening in the transverse mesocolon. I have been fortunate enough never to experience this accident, and I think it is due to the fact that we have always taken the precaution of suturing the intestine to the slit in the mesocolon. The external incision is now closed in the usual way. The pads and sponges are all accounted for. The patient is in excellent condition as he leaves the operating-table.

In cases of duodenal ulcer with a definite history of serious complications, such as this patient presents, and the existence of a pyloric obstruction and retention of  $\frac{1}{2}$  pint of fluid at the end of seven hours, there can be no question in my mind but that the case should be given the benefit of surgical therapy. I am quite converted to the position that duodenal ulcers, as a rule, should be handled by medical management and that 80 per cent. or more of them will be better handled in that way. Where, however, the patient presents a picture of serious complication, such as perforation or hemorrhage or definite organic pyloric obstruction, we would be wasting our time with medical management, and we would not be doing our duty to the patient in the sense that we would not be giving him the best and safest means of cure from this condition.

I want to take advantage of this opportunity to discuss one little matter that I have already referred to in this case to give you the benefit of the experience which I have had with the same

method of treatment. I refer to the use of thick bismuth paste to control leakage from the intestine and particularly from the duodenum. I do not know of any more distressing picture than that of a leak from the duodenum on to the abdominal wall, carrying with it the great irritation of the skin resulting from such a condition, and the great risk of starvation of the patient because of the escape of the stomach or duodenal contents through this duodenal perforation. I have met with this condition a number of times and as a result of several different pathologic pictures, several times as in the case as presented by this patient, of duodenal perforation either subacute or acute, and with leakage after operation for either draining the abscess or repair of the leak.

A number of years ago one of my assistants in a similar case on my service resorted to the use of bismuth paste. He found the bismuth paste recommended by Beck was useful, but was not sufficiently stiff to answer the purposes in some of these cases, and we devised a thicker paste consisting of 30 parts of bismuth, 50 parts of vaselin, 10 parts of white wax, and 10 parts of paraffin at a boiling-point of 120° F., and filled with this paste the crater-like opening at the point of perforation, preventing the escape of intestinal contents. Over the red and irritated skin outside of the opening we applied a rather stiff oxid of zinc paste as a protective. We have succeeded in securing a closure of a number of these intestinal leaks by this method. It is of so much value that I think it should be more widely known. We have now used it not only in duodenal leaks, but in several cases where we have had leakage after resection of the stomach, and in a number of cases where there has been a fistula in the small and in the large intestines. I have used it also in several cases where we have had leakage after resection of the sigmoid or rectosigmoid for carcinoma and diverticulitis.

When we begin with this treatment in the case of a good-sized opening in the bowel the paste has to be used two or three or four times a day. Gradually, as the paste prevents the escape of the fecal contents, the granulation tissue fills up the crater-like opening of larger or smaller size, and it is unnecessary to use

the paste so frequently, and in many cases a few applications of the paste will suffice.

We have within the last few months on our service had a beautiful demonstration of the value of this method of treatment in the case of a woman who had a gangrenous appendix with a large abscess and a gangrene of the cecum at the base of the appendix, leaving a hole large enough to introduce the index-finger into the cecum. On account of an associated lung abscess and the very bad condition of the patient it was impossible to consider any operative treatment for this large opening in the cecum. The opening was so large that it practically amounted to an artificial anus, as for a time most of the fecal contents were passed from this opening and not through the rectum. It seemed rather useless to use the paste in a case of this kind, but we persisted in its employment, and within fifteen or twenty days the opening had been reduced to a mere fistula, and this closed completely later after she had recovered from her lung abscess.

Another case comes to my mind in which this thick paste was of striking benefit. It was in the case of a neglected appendicitis with a long sausage-shaped abscess extending down between the rectum and bladder. The lesion was almost entirely in the pelvis. There were no symptoms referable to the abdomen, and the true diagnosis had been missed on that account by the attending physician. The child, however, attempting to urinate or defecate every fifteen or twenty minutes, I was called in consultation, and this attracted my attention to the necessity of making a rectal examination. Introducing my finger in the rectum I found at once the abscess, which could be very distinctly felt about 3 inches above the sphincter. It seemed as though it was almost ready to perforate. I at once sent the child to the hospital and operated, and found a long appendix with a perforation at its tip leading down to this abscess between the rectum and bladder. The appendix was removed and the abscess drained, but, unfortunately, it was followed by an opening into the rectum about 3 inches above the sphincter. As a result for a number of weeks I had the unusual picture of a case operated



upon for appendicitis with a fecal fistula not extending into the cecum, but extending into the rectum. Hard, formed pieces of fecal matter would occasionally pass out through the appendiceal fistula, and the problem seemed like a very difficult one from an operative standpoint at least. After several weeks I sent the boy to the hospital and, under gas, probed the fistula carefully and found that it extended into the rectum. The difficulties of sewing up this opening in the rectum would, of course, be very great. On that account I resorted to the use of a small amount of this thick bismuth paste, and, fortunately, three or four applications succeeded in curing the fistula completely.

I would like on the basis of my experience with the use of these thick, heavy pastes to emphasize the importance of their employment in the class of cases which I have discussed with you, particularly in duodenal perforation, gastric perforation, and perforation in the small intestine or large intestine associated with fistula. One must not expect too much from such a method of treatment. It will in a good many cases fail. On the other hand, it certainly has proved in a number of cases on our service to have been life-saving, in the sense that it has carried the patient through a serious period resulting from the leak, or else has been actually curative and prevented the necessity of any further operative treatment.

## SPINA BIFIDA

*Summary* : Spina bifida in an infant of three months not involving the cord and with no evidence of hydrocephalus; operation—advantage of a transverse incision; operative findings; closure; dressings; prognosis; possibility of the development of hydrocephalus; surgical therapy in treatment of hydrocephalus—unfavorable results; varieties of spina bifida—treatment—prognosis.

*November 17, 1918.*

I WANT to operate this morning upon an infant about three months old who has a spina bifida. You will see that as I uncover the child and roll it over on its face there is a large tumor mass irregular in shape, looking something like a tomato, situated in the lower dorsal region. As I examine this tumor carefully you will see that a very small part of it is covered with true skin, and this is simply on the margin and at its base. Most of the tumor is covered with a translucent membrane very thin and delicate, about the thickness of a very thin peritoneal sac in a hernia. The mass fluctuates and contains cerebrospinal fluid. As far as I can determine from examination of the tumor and the condition of the child, the spina bifida is limited simply to the membranes of the cord and does not involve the cord itself, as the child seems to have perfect control and function of its lower extremities and of the bladder and bowels. Usually when the cord is involved in a spina bifida situated as high up as this, we find more or less paralysis below this point, which does not exist in this case. The child is a very bright and normal looking infant otherwise. The head is well formed and normal in size and there is no evidence of a hydrocephalus. I regard the case as one favorable for operation, and I have told the parents that the chances of its recovering from the immediate effects of the operation are good and distinctly in the child's favor, and that there is probably about one chance out of three that the child will recover completely and grow up as a normal individual. We have operated on a number of these cases and have come to the conclusion that the simplest and best way of handling this deformity is essentially like handling an ordinary operation for radical cure

of hernia. Of course in the series of cases which we have had we have learned certain things about the technic, which I shall attempt to make clear to you.

The child is lightly anesthetized with ether. The entire field has been carefully prepared aseptically. I shall make a transverse incision in this case just as we do in an umbilical

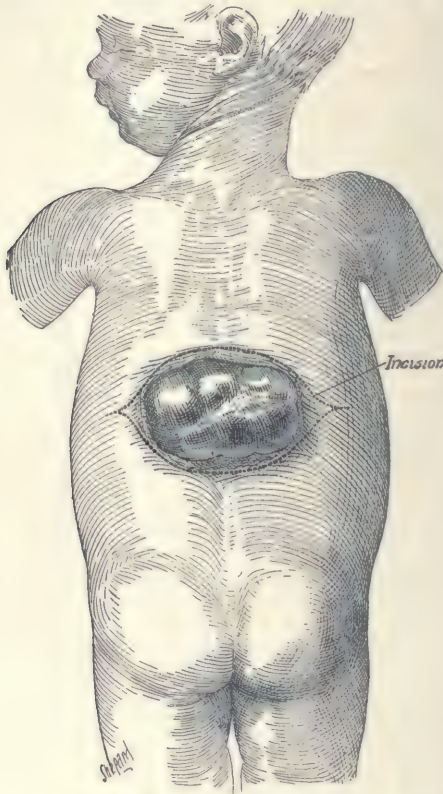


Fig. 25.—Spina bifida.

hernia, because we have learned by experience that it is much easier to close the large defect that is made by dissecting out the tumor if we employ the transverse incision than if we employ a vertical incision. You will notice that I make a large transverse elliptic incision and save all the true skin at the base of the tumor that I can (Fig. 25). I carefully dissect back the integument above and below the tumor, hugging the tumor



closely as you do in dissecting out a very thinned wall sac containing fluid. In spite of great care I have nicked the sac at one point and a dram or two of fluid escapes. This, however, is not a serious matter, as I am simply making this dissection with the idea of not opening the sac, because it is easier to make the dissection with the sac intact than after it is opened. You will see as I continue the dissection that I now come down to what might be termed the pedicle of the sac, which is probably  $\frac{3}{4}$  inch long vertically and about  $\frac{1}{2}$  inch wide. I now open into the sac and find that, fortunately, it does not communicate with the spaces around the cord containing cerebrospinal fluid. It seems to be walled off as you would find a hydrocele of the cord from the general peritoneal cavity by an obliteration of the peritoneal process at the internal ring. I think this is a very fortunate thing in this case. I now remove the entire sac and I can see the cord exposed for a distance of about  $\frac{3}{4}$  inch in a position where three vertebral arches are absent.

The next step in the operation is the making of two flaps of the deep fascia covering the muscles of the back to cover in this defect in the arches. At one time efforts were made to make an osteoplastic closure in these cases, but it was soon found that this was of no value, and gave no better protection than was afforded by covering in the cord posteriorly with flaps from the deep fascia covering the muscles of the back. You will notice that I make these flaps at right angles to the line of my skin dissection. These flaps are about  $1\frac{1}{2}$  inches long and about  $\frac{1}{2}$  inch wide on each side. I now bring the two flaps together by fine catgut sutures and you will see that we have now covered the cord with this dense connective-tissue layer. The incision in the skin and superficial fascia is now closed with four fine silkworm-gut sutures and by a number of fine black silk interrupted sutures, closing it very accurately without any drainage (Fig. 26).

The dressing in these cases I have found to be a matter of very considerable importance. I take some rather stiff sterile oxid of zinc paste and spread it on the dressing, a broad layer of it about 4 inches long and 2 inches wide, and cover the skin

incision completely with this paste. My experience has been that this protects better than any form of dressing the wound

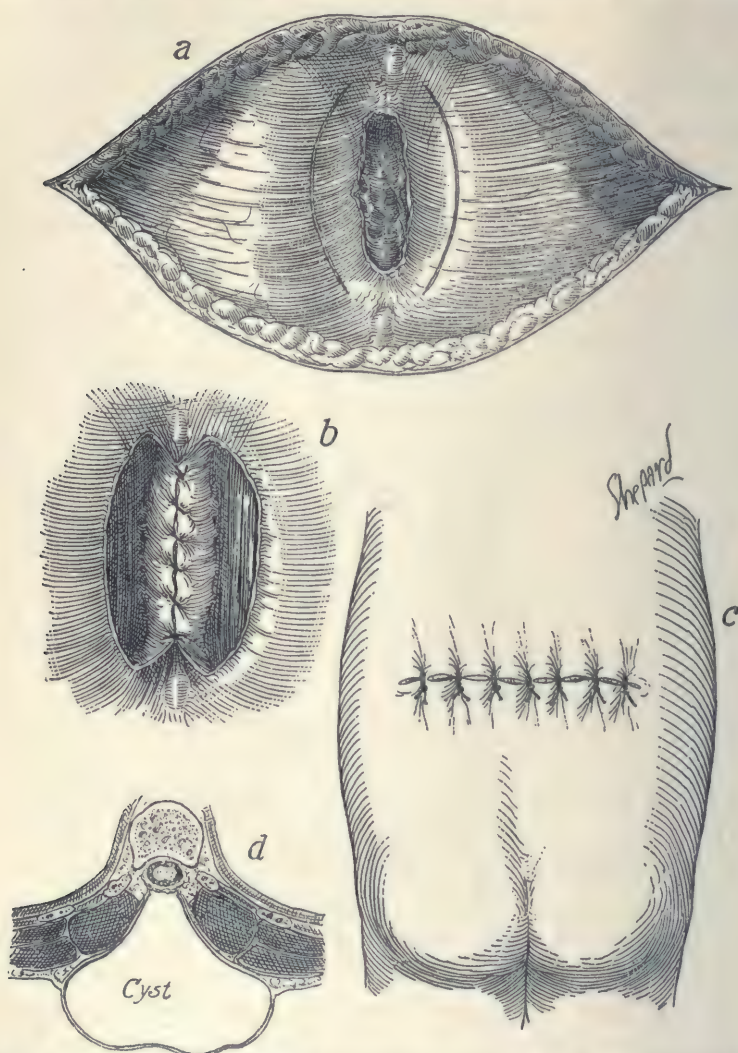


Fig. 26.—Spina bifida: *a*, Incisions in fascia for covering flaps; *b*, flaps sutured together over cord; *c*, closure; *d*, transverse section of spina bifida and cord.

in these cases against infection of the urine and feces, which, of course, are difficult to control in an infant. It seems to me that this case is particularly favorable, and yet we must re-

member that children of this age do not stand operating very well, and even this comparatively simple short operation carries with it a good deal of risk, certainly 25 per cent.

There is another matter, however, that I want to bring to your attention in connection with this case, that is, a considerable possibility of the development of hydrocephalus in these children with spina bifida. We have in several cases had the experience of operating upon a child with spina bifida who at that time did not have hydrocephalus, curing the spina bifida by operation and then later have a hydrocephalus develop. It is probable that the fundamental condition that produces the hydrocephalus also produces spina bifida. I say that because we so often see the two conditions combined in the same case, and, indeed, the majority of children that have been brought to us with spina bifida have also had hydrocephalus. Where the two conditions exist I refuse to operate upon the case, because we have in no case helped these children, as they have without exception gone on to a fatal termination from the hydrocephalus even where we have been able to cure the spina bifida.

A few years ago my assistants and myself took up the subject of the surgical therapy of hydrocephalus, and worked at it for several years, operating upon a number of cases with the hope that we might cure these little patients or at least prevent the further progress of the disease. We drained a number of these cases into connective tissue outside the skull, using silver tubes and glass tubes extending from the distended ventricles to the areolar tissue under the scalp, but without benefit in any of the cases. As you probably know, more elaborate methods have been employed, such as draining the cerebrospinal fluid into the peritoneal cavity through a very complicated operation of laminectomy and laparotomy, and carrying silver wire or some non-absorbable substance like silkworm-gut from the membranes of the cord to the peritoneum. Harvey Cushing experimented with a number of these cases, but I think without benefit, and this operation has been discarded. The use of a drain properly prepared and introduced from the dilated ventricle through a trephine opening into the areolar tissue under the scalp has also



been employed. Puncture of the corpus callosum has been used in a number of cases, but, on the whole, I think we can state with a good deal of certainty that today we have no surgical therapy for hydrocephalus that is worth while, and unless in the future some more favorable methods of handling these cases are introduced, we should for the time being refuse any further experiments in this disease.

Coming back for a moment to the subject of spina bifida, I desire to call your attention to the fact that this condition presents itself to us in three varieties, as far as the structures involved are concerned. The first and simplest variety, which is represented by the case we have just operated upon this morning, is one in which the tumor is formed entirely independent of the membranes of the cord and of the fluid which they contain. The second form is one in which the tumor is situated below the spinal cord in the lumbar region and in which the nerves of the cauda equina are involved in the tumor, so that if we remove the tumor we paralyze the lower extremities, or as much of the lower extremities as are supplied by the nerve trunks that are cut in the dissection. There is a third condition in which the spinal cord itself is thinned out over the sac and in which the cavity containing the fluid is the greatly dilated central canal of the spinal cord. Of course in these cases any removal of the tumor would mean practical section of the spinal cord at that point, and is not to be considered at all. As a matter of fact, the cases of spina bifida that are amenable to surgical treatment are limited almost entirely to the first class of cases, such as our little patient this morning. It is not always possible to determine this point beforehand, but in a dissection where we find that the nerve trunks of the cauda equina are involved or the spinal cord itself, the only thing the surgeon can do is to remove the great mass of tumor, allow the fluid to escape, to fold in as carefully as possible the nerves or the cord which are then exposed, and to make a closure of the superficial fascia and integument as we have done in this case, recognizing, however, the fact that the prognosis in these cases, no matter how carefully handled, is extremely bad.

## CARCINOMA OF FACE

*Summary:* Epithelioma of the face destroyed on three occasions by cancer paste; paralysis of facial nerve as a result either of lesion or of paste treatment; removal by means of electric cautery knife; after-history—covering of charred surface with Thiersch grafts—dressing of skin-grafts; radical operation the best method of handling this type of carcinoma.

*December 4, 1918.*

THE first case I shall present to you this morning is this old gentleman, eighty years of age, who comes to us with this very large superficial epithelioma of the right side of the face over the parotid region. He gives the following history:

The process began about three years ago as a small superficial epithelioma, and he has had it destroyed on three different occasions with cancer paste. There has, however, never been a complete healing, and a more or less open sore has persisted since the beginning of the trouble.

There is one interesting feature of the case that I want to call your attention to, which is quite often possible as a result either of the lesion or of the cancer paste treatment. There is a paralysis of the facial nerve on that side, at least that portion of it which supplies the muscles of the lip and cheek, and to a slight extent of the orbicularis palpebrarum, although that is not complete.

A careful examination of the neck fails to show even at this stage of the disease any evidence of enlarged glands. Microscopic section of the lesion shows a typical epithelioma. I shall do here a radical operation, following the plan of treatment which we have pursued for some time. There is no contra-indication in this case to a general anesthetic, so that we shall do the extirpation of the cancer under drop ether.

The patient is now anesthetized sufficiently to proceed with the operation. I shall cut this cancer out with an electric cautery knife, going very wide of the gross lesion and without respecting any tissue. It is not necessary for us to consider the

question of facial nerve paralysis, as we already have this condition existing. It will be necessary to remove a large part or all of the parotid gland and to divide the terminal branches of the carotid artery, the temporal, and internal maxillary. The electric cautery knife which I am employing is admirably suited to work of this kind. I am cutting this carcinoma out as one would cut away rot in an apple (Fig. 27, *a*). The electric cautery knife seals the smaller vessels and prevents any considerable bleeding. As I come down to the terminal branches of the external carotid, the temporal and internal maxillary, it is necessary, as you see, for me to ligate these by transfixing the tissues about them with a curved needle and ligating the vessels with fine catgut. I expose and remove the parotid gland and the periosteum of the posterior border of the ramus of the jaw for a distance of about  $1\frac{1}{2}$  inches long and about  $\frac{1}{2}$  inch wide. I have now removed the entire lesion and have succeeded in controlling the hemorrhage. I shall dress this with some iodoform gauze over this charred area and with a fairly copious dry dressing.

**After-history.**—The patient made an admirable operative recovery. At the end of ten days the superficial char from the electric cautery knife had separated, leaving a red, granulated, healthy surface. I covered this entire surface with several large Thiersch grafts taken from the outer surface of his thigh. The lower jaw was uncovered for a distance of about  $1\frac{1}{2}$  inches and  $\frac{1}{8}$  to  $\frac{1}{2}$  inch in width. This was covered with a skin-graft, as was the rest of the area (Fig. 27, *b*).

In dressing the skin-grafts we adopted a plan which has given us a good deal of satisfaction in these cases, and that is of applying no dressing on the graft itself, but using a wire frame, something like the small Esmarch mask that anesthetists use, covered with wire screen such as we use in windows. This frame was large enough to extend for a distance of about an inch around the skin-graft and was held in position by strips of adhesive plaster without any other dressing applied (Fig. 27, *c*). In other words, the skin-grafts were left freely exposed to the air.

Every particle of the graft took, and at the end of another ten days he was discharged from the hospital as an operative



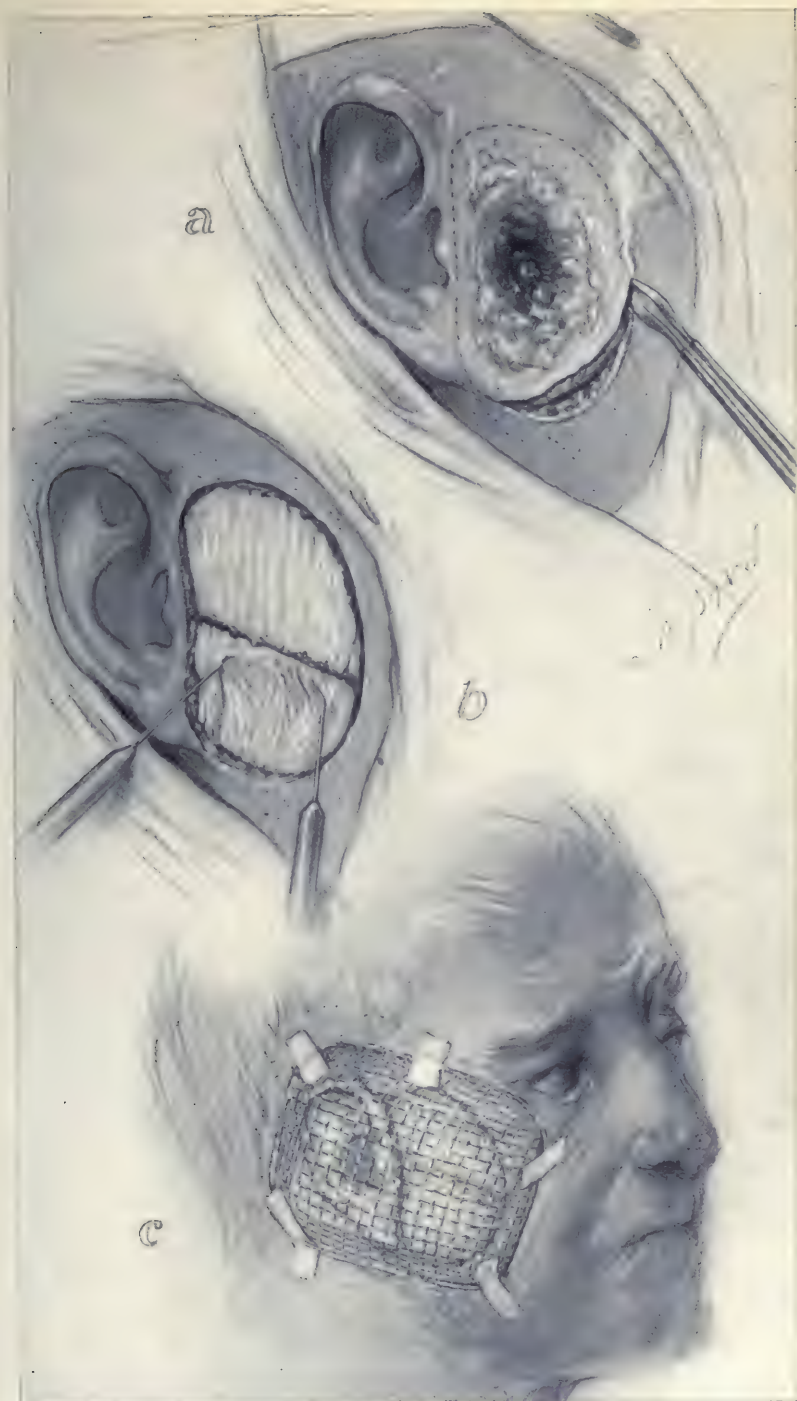


Fig. 27.—Carcinoma of face: *a*, Excision of carcinoma; *b*, placing of skin-graft; *c*, graft protected by screen.

cure. I am inclined to have this patient use moderate x-ray treatments, short of any possibility of burning, for several months as an additional insurance against recurrence.

The case looked at first sight when he came to the hospital as a hopeless one, and several surgeons had refused to consider a radical operation. We have, however, had a number of these cases which have been permanently cured, especially in cases of this particular type of slow-growing epithelioma, which have lasted for years without any regional involvement of the lymphatic glands. From a careful analysis of a number of these cases resected in our clinic we have come to the conclusion that this radical removal with the electric cautery knife followed by skin-grafts is the best manner of handling these extensive skin carcinomata.

## CARCINOMA IN THE AXILLA

*Summary:* Carcinoma in the axilla in a patient presenting no evidence of a primary focus elsewhere in the body; removal; after-treatment; value of radical operation in carcinoma of the breast with extensive lymphatic involvement.

THE second case which I shall show you this morning is an unusual one, but an example of a small group of cases which we have been called upon to handle in the last few years. It is a case of carcinoma in the axilla, apparently not involving the breast proper, but developing probably from a remnant of the mammary gland tissue extending from the ordinary location of the breast up toward the axillary space.

This woman is fifty-five years of age. Her general health has been fairly good. She has noticed this hard mass in the axilla for the last five or six months, and comes now for an opinion and treatment. I think there can be little doubt after our careful analysis of the case that this is a primary carcinoma in the axilla from a breast remnant. An exhaustive examination fails to show any primary focus of carcinoma elsewhere in the body.

Under ether anesthesia I shall expose this area fully, making an incision along the outer border of the pectoralis major muscle with the arm extended at right angles from the side, beginning the incision at the point of insertion of the pectoralis major to the humerus and carrying it along the border of the muscle to a point about opposite the nipple (Fig. 28). It may be necessary for me to divide the pectoralis major and possibly even the minor in the dissection required to remove the malignant mass. If, however, by retraction of these muscles I can gain wide exposure I shall not sacrifice them, as I regard an operation here as probably palliative. Nor shall I remove the mammary gland itself unless I find that it is grossly involved for the same reason.

Opening the axillary space widely I now come down to a hard mass of tissue beginning just above the mammary gland



and extending up into the axilla, and involving very extensively the axillary glands as far as I can feel them in the angle between the clavicle and ribs. Holding the incision widely apart with retractors I expose first the axillary vein and use this as a guide in making the dissection. Freeing the vein quite fully, I now expose the brachial plexus or nerves, the axillary artery and its branches, and, keeping well out into what seems healthy adipose tissue, I remove the entire lesion *en masse* (Fig. 29). This necessitates my doubly ligating, as you see, the half-dozen branches of the axillary artery and vein, and also requires the removal of two small intercostohumeral nerves, which I find extending from the thorax to the inner surface of the upper arm. There is no distinct mammary gland tissue in this mass, at least to macroscopic examination. Although I have been able to remove all of the grossly involved tissue, I am quite satisfied that the mediastinal glands are most certainly involved in this case because of the wide involvement of the axillary glands themselves. The incision is closed, leaving a collapsible rubber tube about the center for drainage.

This case should be given the benefit of thorough x-ray after-treatment, and there is a very good prospect of a distinct palliation from the operation and the x-ray treatment, and even a possibility of permanent cure, but this I regard as exceedingly slight.

My attention has been recently called to the fact that some surgeons are preaching the doctrine that when the axillary glands are involved in a carcinoma of the breast, operation is almost certainly merely palliative and almost never curative. I cannot accept this viewpoint, and as a basis of the evidence in favor of the position which I can present to you I want to say that only within the last week a woman returned to my office upon whom I had done a very extensive radical cure for carcinoma of the breast and extensive involvement of the axillary glands more than five years ago. She had following operation a rather marked edema of the upper extremity. After operation I gave her physicians and friends an absolutely bad prognosis because of the extent of the axillary involvement. Her physician gave



Fig. 28.—Carcinoma in the axilla.





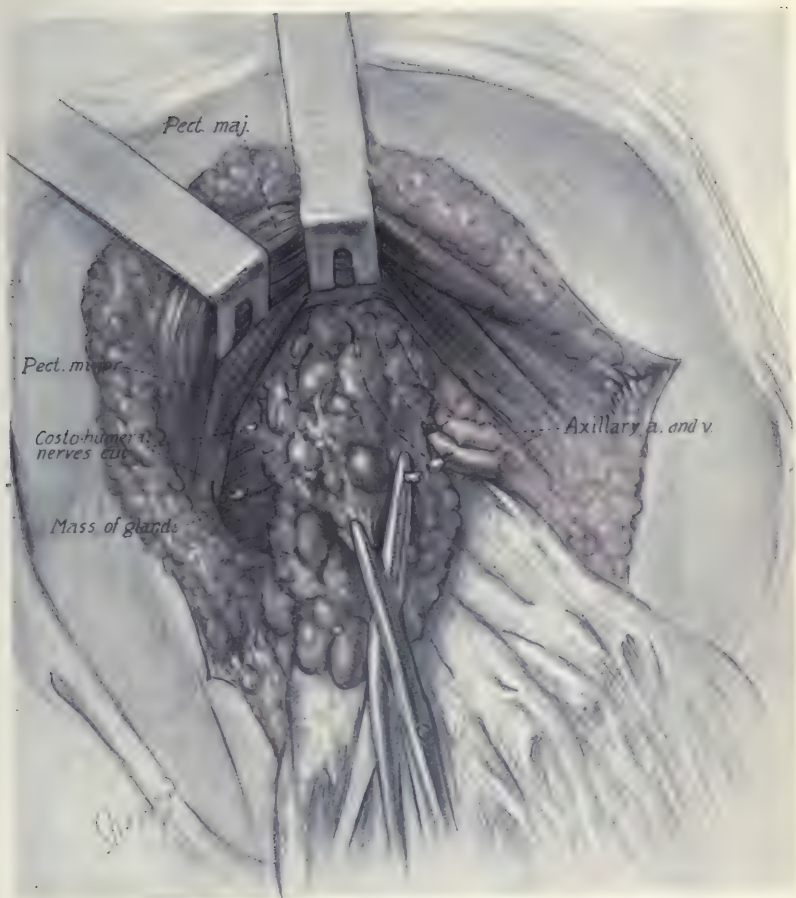


Fig. 29.—Carcinoma in the axilla: Involved glands dissected out.



her thorough x-ray after-treatment, and, in spite of my fear of an early recurrence, she has already lived now more than five years after operation without any evidence whatever of a carcinoma. The edema of the upper extremity has not progressed. I must conclude now that it is due not to an obstruction of the lymphatics by carcinoma, but of an obstruction because of the wide removal of the axillary lymphatics and scar tissue interfering with the circulation. I can recall a number of very similar cases. As a result, therefore, I do not withhold from these patients with axillary involvement, even though extensive, the possible benefits of a radical operation. I am, of course, cognizant of the fact that the prognosis in those cases in which there is no axillary involvement is very much better than in those where it exists. I do not think, however, that it is proper for us to go so far as to take the position that there is absolutely no prospect of a cure, because I think some prospect does exist. I feel very strongly that these cases should be given the benefit of an operation because of the long palliation which I feel confident the radical operation has given these patients.





## SARCOMA OF THE LABIUM

*Summary:* Recurrence of tumor in the labium following removal fifteen months previously; operation—technic of closure.

THE third case I shall present to you this morning is that of a woman of sixty-five, who came to us fifteen months ago with a large tumor in the labium about the size of a good-sized hen's egg. This was quite movable and I was not willing to make a definite clinical diagnosis. I operated at that time under general anesthesia and made a wide radical removal of the tumor, which proved to be a sarcoma. She comes back to us now with a recurrence about half the size of the original mass, and I shall do as I did before, make a radical removal of the recurring growth. The general condition of the patient is now not as good as it was at the time of the original operation. She has developed a condition resembling a paralysis agitans, and there has been some thought among her attending physicians that this may be due to a secondary involvement of the nerves and possibly of the cord from this sarcoma. We have studied that phase of the case with a good deal of care and are not able to establish any definite relationship, and I am rather inclined to believe that the paralysis-agitans-like condition is independent of this neoplasm.

It is not difficult for me by making a large vertical incision to remove this mass and to keep well outside of what is grossly the neoplasm (Figs. 30 and 31). The hemorrhage, as you see, is rather profuse, requiring the ligation of a number of vessels. I shall take the precaution, as you see, to eliminate any possibility of a dead space by obliterating the cavity from which the tumor is removed by fine catgut sutures (Fig. 32). This requires, as you notice, two rows of sutures to obliterate the space completely, and the external incision is closed with fine black silk suture (Fig. 33). I shall advocate the use of *x*-rays as a means of after-treatment. I think it is quite possible that she may

have no further recurrence after this operation, although, of course, the history is not encouraging.

I am glad of the opportunity of showing you this case because it is an unusual one, and we have had but few cases of sarcoma of the labium on our service.



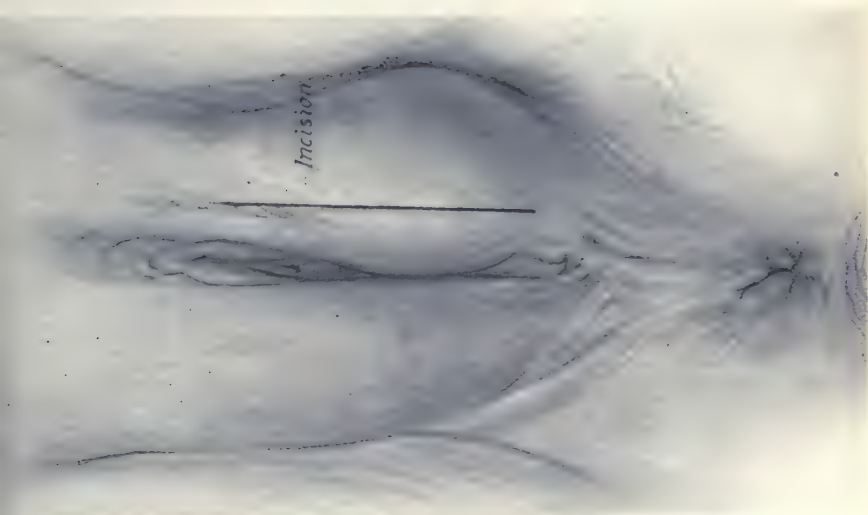


Fig. 30.—Sarcoma of the labium.

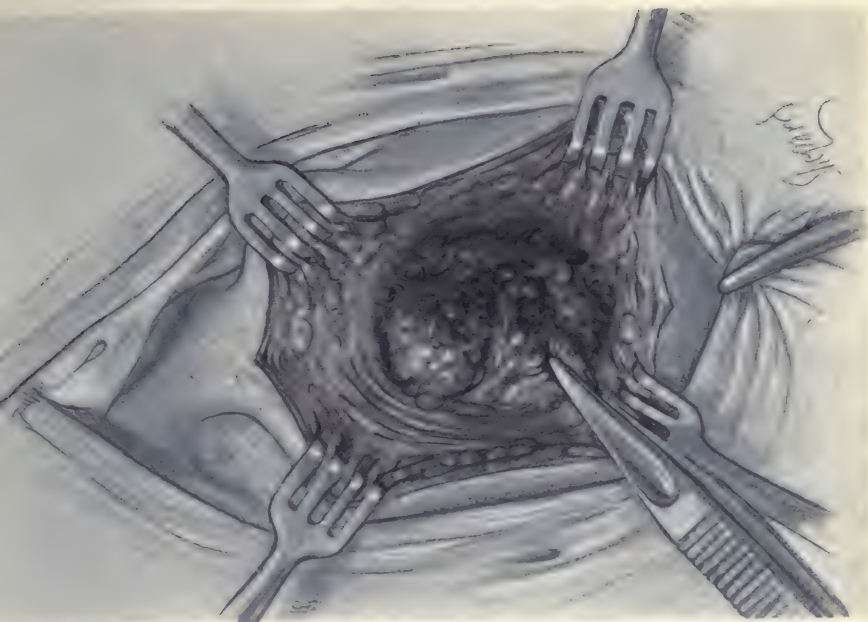


Fig. 31.—Sarcoma of the labium: Tumor dissected out.





Fig. 32.—Sarcoma of the labium: First steps of closure.

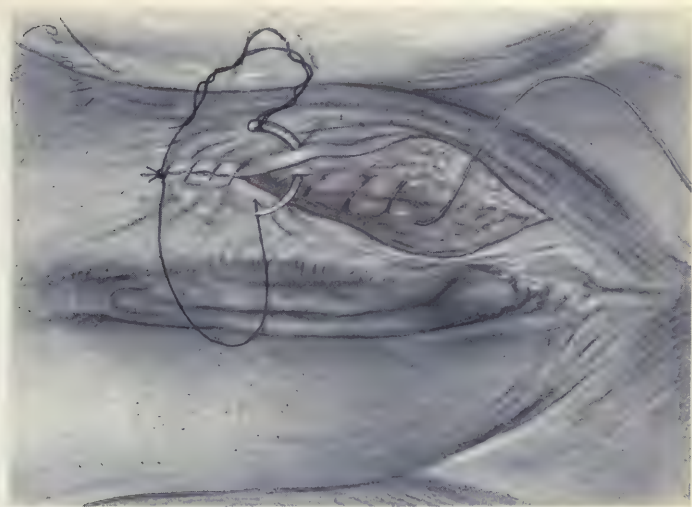


Fig. 33.—Sarcoma of the labium: Second closing sutures placed.





## CLINIC OF DR. JOHN R. HARGER

SURGICAL DEPARTMENT OF THE UNIVERSITY OF ILLINOIS

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### SARCOMA OF THE LIVER IN A CHILD OF SEVENTEEN MONTHS; SARCOMA OF TESTICLE, WITH METASTASES IN THE LUNG SIMULATING TUBERCULOSIS

*Summary:* History of case; examination; necessity for immediate operation; laparotomy—operative diagnosis—technic of removal of tumor; after-history; microscopic examination of tumor mass; report of a case of sarcoma of the testicle with metastases in the lung simulating tuberculosis—history; examination; diagnosis; removal of testicular tumor; after-history; autopsy findings; comments.

### SARCOMA OF THE LIVER IN A CHILD OF SEVENTEEN MONTHS

I WANT to present to you today an emergency case in which the real diagnosis is somewhat obscure. This child was brought to the clinic at 4.30 P. M. apparently in pain, with a lump in the right lower part of the abdomen.

She is seventeen months old. Birth was normal and she was breast fed. At birth a small blue mark was present on the left upper lip, which soon became red. It increased in size quite rapidly up to the age of one year, at which time the child was placed under the care of Dr. Frederick G. Harris, who treated the growth with x-ray and radium. Dr. Harris states definitely that the growth on the lip was a cavernous angioma, containing no pigment, that at no time did it show any evidence of proliferation of a malignant nature, and that it responded very rapidly to treatment.

The father states that for two or three months the child has been peevish and seemingly not well. Eight days ago he noticed that she did not want to eat, and four days later a lump appeared in the right lower part of the abdomen. However, the child

manifested a desire to play until the last two days, and last night she cried nearly all night and acted as if she were in pain. The father further noticed that she had lost 2 or 3 pounds in weight during the past week and that her skin was getting yellow. During the past twenty-four hours the bowels have moved several times, but no blood was noticed. She vomited once during that time.

*Physical examination* shows a well-nourished but very restless child, who cries and frets continually and forcibly resents any attempt at examination. Her skin is moist and warm and the color is not altered sufficiently to attract attention. The left upper lip shows a pale, irregular, superficial scarring, with only slight traces of the above-mentioned growth. The chest is negative.

*Inspection* of the abdomen shows a moderate distention, which is uniform except for a slight elevation at McBurney's region, 3 or 4 inches in diameter. On *percussion*, tympany is quite marked and generally distributed except over the elevation, which is distinctly dull. There is no dulness in the flanks. Liver dulness extends a trifle below the costal arch, but a definite tympanitic area is noted between the liver and the dull elevated mass. Palpation verifies the tympany and, in addition, reveals a general rigidity and tenderness, which is more evident over the right side and especially over the mass. The mass is moderately firm and slightly movable.

Her temperature is 101° F. per rectum and pulse 180. Two blood examinations both show a white count of 6100.

The child will immediately be prepared for operation. An S. S. enema was given, which resulted in the passage of considerable flatus. This was followed by a combination enema which brought a slight amount of fecal matter, but no blood.

Intussusception or an appendiceal abscess seems to be the most probable diagnosis, but the nature and frequency of the stools and the results obtained by the enemas speak against the former, and the low blood count is not in keeping with the latter. However, the presence of such a distinct mass together with the history and symptoms are enough to convince one that the



patient is suffering from a surgical lesion and that no time should be lost in an attempt to give the child relief.

The child has been anesthetized with ether. I shall make an incision along the linea semilunaris. The peritoneum is discolored. As I open the peritoneal cavity a large, dark, bleeding mass appears in the operative field and a considerable amount of dark, bloody fluid bathes the entire body cavity. The mass is nowhere adherent. The entire surface is smooth and firm except over the most anterior portion, where there is an irregular opening large enough to admit three fingers (Fig. 34, 1). Continuing the examination, I find that the mass is attached to the right lobe of the liver by a pedicle about the size of the span of the thumb and finger of my examining hand. A hurried general examination reveals no apparent involvement of the other abdominal viscera. From the findings I would say that this patient is suffering from a sarcoma of the liver, probably of a melanotic type.

If this is a sarcoma, the child's condition is hopeless. Considering that the mass is attached to the liver by a pedicle, the bleeding from the stump of which can be readily controlled, and that there is already a large bleeding surface present which cannot be easily controlled, I believe it would be good surgery to remove the mass.

I am placing a small rubber catheter about the pedicle, tying it fairly tight, and putting a suture through it to prevent slipping. I am also putting several No. 3 chromicized catgut sutures through the pedicle and astride the catheter, which thus plays a double rôle of controlling the hemorrhage and preventing the sutures from cutting into the liver tissue (Fig. 34, 2a). I am cutting one end of the catheter short and permitting the other end to project through the upper angle of the wound to facilitate removal at a later date should the child survive the operation. The mass is removed by cutting within  $\frac{1}{2}$  inch of the catheter, and to the cut surface, which is about the size of the palm of my index-finger, I will apply the actual cautery (Fig. 34, 2). In this way the bleeding is completely controlled. I am inserting a light gauze packing and will close the abdomen

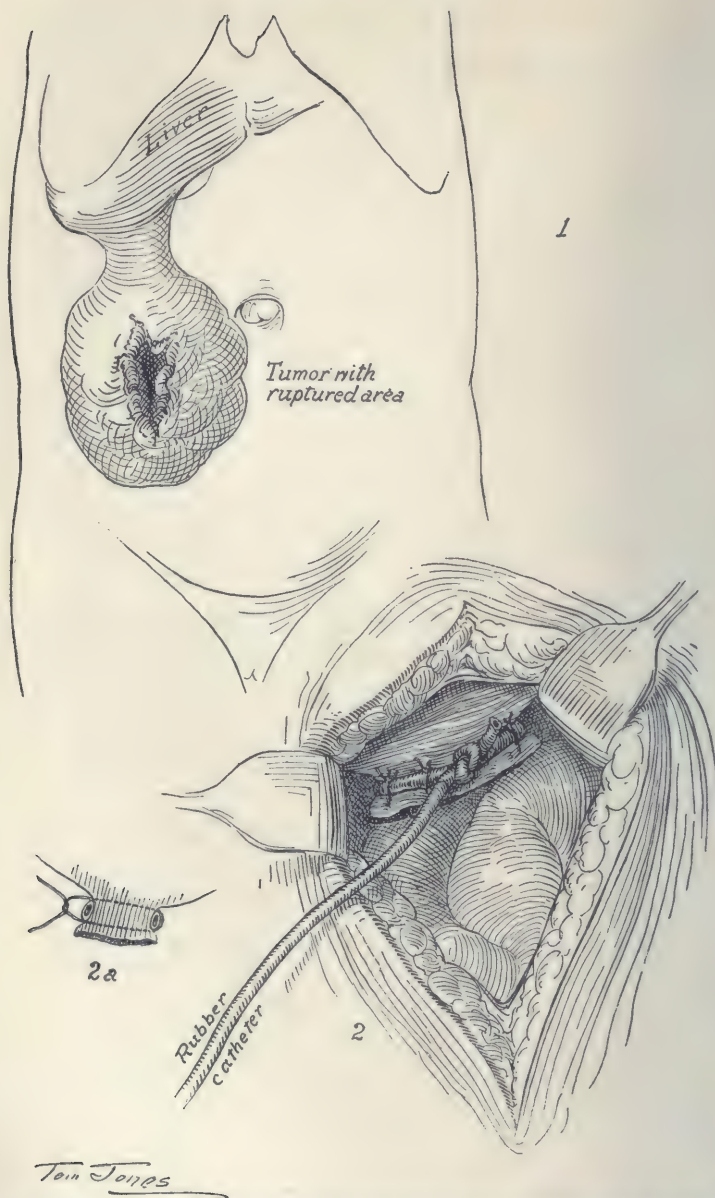


Fig. 34.—1. Indicates clinically the location, size, and contour of the tumor, and its relation to the liver. 2. Shows the pedicle after being ligated and tumor removed. 2a. Diagram illustrating the placing of the suture about the loops of the catheter to prevent their cutting into the liver tissue.

as quickly as possible, so as to subject the child to the least possible shock.

**After-history.**—The patient rapidly recovered from the effects of the short anesthetic. The operation was performed about 7.00 P. M., and by 9.00 P. M. the pulse was 170. However, she soon became restless, and in spite of our efforts the temperature went up rapidly, the pulse became weaker and slower, and she died about seven hours after operation. No autopsy was permitted. The mass removed at operation was examined by Dr. W. H. Burmeister, who reported it to be a small round-celled sarcoma (lymphosarcoma) of the liver, with complete destruction of all the liver tissue with the exception of the bile-ducts.

While we are not justified in claiming that this was a primary sarcoma of the liver, it is logical to suppose that if there were a primary focus elsewhere, it would have manifested itself. With no lung findings and an absence of any other abdominal involvement or any superficial evidence of tumor, it seems likely that the tumor mass very probably had its origin in the liver. Had we been permitted to hold an autopsy the question would have been definitely settled.

#### SARCOMA OF TESTICLE, WITH METASTASES IN THE LUNG SIMULATING TUBERCULOSIS

In connection with this case I wish to cite another one of sarcoma, which came under my observation on March 15, 1916. For seven months previous the patient had been under treatment for a pulmonary lesion which simulated tuberculosis. I was called to see the man because of a very marked enlargement of the right testicle. The patient was thirty-one years of age, had had gonorrhea several years before, followed by an attack of right-sided epididymitis. Some time during the summer of 1915 he had a slight injury to the right testicle. In September he noticed for the first time that this testicle was larger than normal. He consulted a physician, who told him he had a hydrocele.

In October he had a hemorrhage from the lungs. This was repeated at frequent intervals, and varied in amount from a



slight show to a cupful or two, continuing until January, 1916, at which time an artificial pneumothorax was done. Repeated examination of the sputum did not reveal any tubercle bacilli. He lost gradually in weight and strength, and after the early part of January, 1916, he was confined to the house. For the four or five weeks preceding my examination the temperature did not rise above normal at any time, the pulse-rate varied from 90 to 120, and the respirations from 30 to 40. The testicle had continued to increase in size until it was so large and heavy that the patient was unable to turn in bed without assistance. It was never painful and gave trouble only because of its weight.

When I first saw the patient he was lying in bed in a semi-sitting position. His features were pinched and he appeared poorly nourished. The breathing was rapid and shallow, and he had an occasional cough. His tongue was furred and breath was foul.

Inspection of the chest showed marked emaciation and very limited respiratory expansion. Percussion gave a flat note over the greater part of the left chest, but hyperresonance over the right, except in the area between the sternum, right nipple, and liver, which was dull and apparently continuous with the liver dulness. On auscultation the breath sounds were absent over the left chest, but exaggerated over the right.

The abdomen was boat shaped, with no tumor masses nor areas of tenderness apparent. The liver dulness extended three fingerbreadths below the costal margin.

There was a tumor about two-thirds the size of the patient's head in the right testicle. It was uniform in shape except on the ventral surface, where there were two cone-shaped elevations about 2 inches in diameter. The whole mass was semisolid and did not fluctuate except over these two cone-shaped elevations. There was no tenderness except when the pedicle was put on the stretch. The superficial vessels were dilated and prominent.

From the history and symptoms I concluded that the patient was suffering from a sarcoma of the right testicle, with prob-

ably a secondary sarcoma in the left lung, which was producing the hemorrhages and consolidation. The only indication for

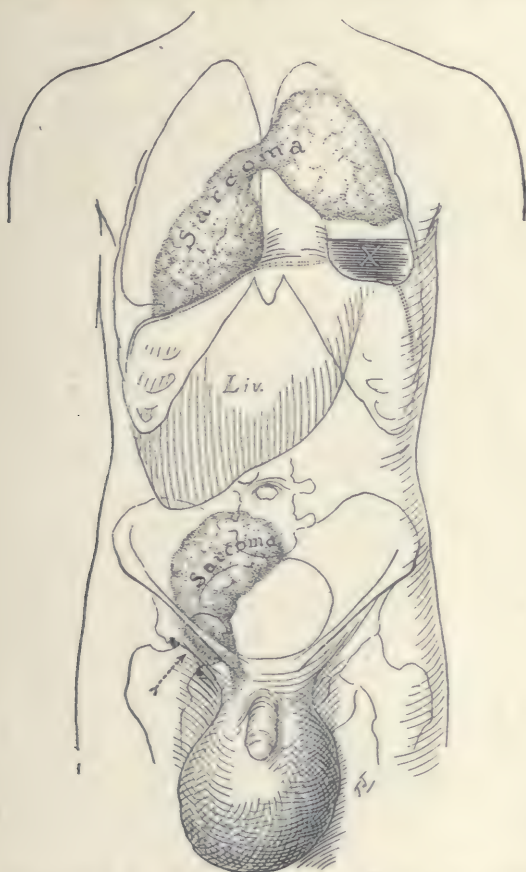


Fig. 35.—Enormous size of the scrotum containing the primary sarcoma, which extends through the inguinal canal and about the brim of the pelvis. The arrow points to the head of the femur resting inside the pelvis, having broken through the eroded pelvic bones. The sarcoma fills the greater part of the left lung and extends through the mediastinum into the right pleural cavity. The X indicates the fluid in the left pleural cavity. It will be noted that the liver lies abnormally low, due to pressure from above the diaphragm caused by the sarcoma in the lung.

operation was to relieve the patient of the burdensome mass and to enable us to verify the diagnosis microscopically. To that end I removed the right half of the scrotum with the tumor

mass under local anesthesia on March 16, 1916. The tumor mass weighed  $4\frac{1}{2}$  pounds and contained about a pint of bloody fluid. On cut section the anterior two-thirds was pink, fibrous,

and hard, while the posterior third was a pale yellowish, friable, degenerated mass (Fig. 35).

The patient suffered no apparent ill-effects from the operation and the wound healed kindly in about three weeks. Gradually, however, he grew weaker, coughed moderately, and raised considerable mucopurulent material, which was occasionally blood-stained.

On April 10th he experienced a sudden severe pain in the right hip, which continued more or less constant, depending upon the amount of morphin administered. Subsequently any movements of his right leg or body caused intense pain. Four days later the patient died.

A very interesting state of affairs was found at autopsy. The right pleural cavity was obliterated laterally and posteriorly by dense adhesions, but the anterior portion of the lung was free and collapsed, and there were no palpable nodules in



Fig. 36.—Left lung in longitudinal section. Note the extent of the sarcoma, the small amount of normal lung tissue, a few tuberculous foci near the apex, and the attached pericardium.

this lung. The left pleural cavity was completely obliterated except for the lower lateral portion, which contained about a pint of bloody fluid. The left lung was completely consolidated and was removed only by taking the parietal pleura and a portion of the pericardium (Fig. 36). Section through the lung



showed it to be a tumor mass except for a small portion of the apex (Fig. 37). Continuous with the left lung and extending across the posterior mediastinum and down into the right pleural cavity was a tumor mass about the size of a baby's head. This mass was firmly attached to the diaphragm and right side of the pericardium, and when removal was attempted it was found to be extremely friable and of a light pink color. It was



Fig. 37.—Sagittal section of the sarcomatous testicle partly covered with scrotum.

this sarcomatous mass which gave dulness on percussion at the time of the physical examination. The heart and pericardial cavity was free from any evidence of tumor growth.

The liver extended to the level of the umbilicus and right iliac spine, but was perfectly smooth and free from adhesions. On cut section there was no evidence of tumor nodules. The spleen, kidneys, and pancreas showed no evidence of tumor.

In the right lower quadrant of the abdomen there was a smooth mass which extended from the symphysis and inguinal canal along the lateral margin of the pelvis to the iliac fossa and up to the sacrum and first lumbar vertebra. This mass was covered with a firm capsule. When this was broken, a pale pink, friable mass was scooped out with the hand. Under this mass the pelvic bones were eroded and absorbed, and the smooth round head of the right femur was found lying inside the pelvic cavity (see Fig. 35). It was the breaking through of the head of the femur into the pelvic cavity which produced the severe pain in the right hip four days before death.

The microscopic examination of the tumor removed at operation and the autopsy findings confirmed the diagnosis of primary sarcoma of the testicle with metastases in the lung. It is a well-recognized fact that sarcomata produce metastases by way of the blood current far more frequently than by the lymphatics, while the reverse is true of carcinomata. Through the spermatic veins, the vena cava, and the right heart it is but a short course from the right testicle to the lungs. The direct extension of the process through the inguinal canal and along the brim of the pelvis may have started by way of the lymph channels of the spermatic cord, but at the postmortem examination no enlarged lymph-glands were found anywhere.

That a sarcoma of the lung should simulate tuberculosis has been known for many years. William Hey, in 1809, described a testicular tumor, the removal of which was followed by a fatal lung condition supposed to be tuberculosis. Doubtless, it was a metastatic sarcoma of the lung. O. E. Kunkel, in the New York State Journal of Medicine, April, 1916, reported a case of primary melanotic sarcoma of the lung, which had been treated for eight months as pulmonary tuberculosis. A diagnosis of malignancy was not made until the patient developed an effusion and died, but the true type of malignancy was determined only at the autopsy.

# CLINIC OF DR. GUSTAV KOLISCHER AND DR. J. S. EISENSTAEDT

MICHAEL REESE HOSPITAL

## REPORT OF FIVE CASES

*Summary: Case I.—Traumatic rupture of kidney:* Patient giving a history of injury to right flank; results of cystoscopic examination; choice of therapeutic measures to be employed; operation—technic—difficulty of suturing suffused renal tissue—transplantation of perirenal fat over site of suture.

*Case II.—Nephrolithiasis:* Recurrence of kidney symptoms following pyelotomy—x-ray examination reveals a stone in the kidney; operation—perfect readaptation of muscles and fasciæ following first operation—advantages of the muscle-splitting operation and the transplantation of perirenal fat; removal of stone.

*Case III.—Nephrolithiasis:* Patient giving a history of constant pain in the right renal region following a nephrotomy several years previous; x-ray examination shows the presence of several concretions in right kidney; operation—difficulties encountered—removal of kidney; greater part of pathology due to technic employed in first operation—evil results which follow the cutting of the muscles.

*Case IV.—Impacted ureteral stone:* Patient presenting symptoms usually ascribed to renal lithiasis; pelvic Roentgen picture shows a longitudinal shadow in the vesical region, and on cystoscopic examination the intravesical part of the ureter appears to be occupied by a dark shadow; diagnosis—stone in the lowest part of the ureter; treatment.

*Case V.—Syphilis of bladder:* Patient giving a history of pains in bladder and some frequency of urination; cystoscopic examination; diagnosis—syphiloma of vesical mucosa.

### CASE I.—TRAUMATIC RUPTURE OF KIDNEY

THE first case we shall present to you this morning is an interesting one, inasmuch as it illustrates the possibilities encountered in diagnosing and treating a traumatized kidney.

The patient states that about a week ago he was run over by a truck, one wheel passing over his right flank. Severe shock followed the accident and he passed blood in his urine. After recuperating somewhat from the shock he experienced exquisite



pain in the right hypogastric region. Suggillation was present, but no rupture of the skin. Since the accident he has not felt well. The urine occasionally contains blood, and movement of the body is always accompanied by pains in the right side.

On examination the patient appears to be somewhat anemic and the superficial mucosæ are slightly blanched. He walks with a noticeable limp, favoring his right side. The skin of the iliocostal incisura is discolored by a bluish area about the size of two hands. The normal curve of this region is flattened out and the whole area is sensitive to the touch. Careful palpation reveals the presence of diffuse deep resistance, and sudden touching of the renal region excites defensive contraction of the overlying muscles.

The urine which he voided in our presence was slightly tinged with red.

Cystoscopy revealed a normal bladder mucosa. The left ureteral mouth showed nothing unusual. The right one was round, slightly rigid, and each urinary jet coming out of it was distinctly reddish. Upon slight massage of the right renal region a little filiform coagula appeared in the ureteral mouth.

Co-ordinating the details of the history and the results of our examination, we are justified in making a diagnosis of a traumatic rupture of the right kidney. The persistence of the blue spot in the right flank speaks for continuous bleeding in this area, which supposition is verified by the examination of the voided urine showing fresh blood and by the observation of the ejaculation of bloody urine from the ureteral mouth.

The choice of the therapeutic procedure is influenced by the following considerations: While it is true that expectant treatment of rupture of the kidney for cases without alarming symptoms will furnish apparently good results, this acquiescence to surgical inactivity is not justified in the majority of cases, especially if they are qualified as our case is.

Persistent bleeding even of a minor degree is by no means an indifferent occurrence. That the bleeding is continuous is indicated by the persistence of the subcutaneous hematoma and by the staining of the urine. It is a matter of experience that

even if the hemorrhage finally stops definitely, the hematoma around the kidney almost invariably becomes infected, leading to all the dangers of a perirenal abscess, while a definite organization of such a hematoma is apt to lead to a cicatricial compression of the kidney. Modern surgical technic offers all the advantages of repairing the damage done by the accident and the prevention of all the untoward sequelæ mentioned above.

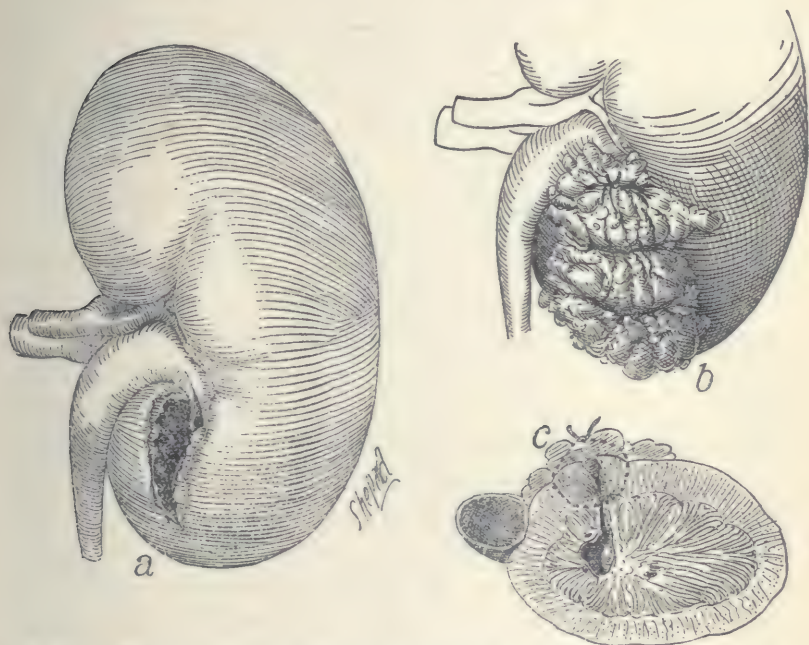


Fig. 38.—*a*, Ruptured pole of kidney; *b*, rupture closed with sutured fat; *c*, section showing placing of sutures.

The patient is now thoroughly anesthetized and we shall expose the kidney through a lumbar incision. We will first clean out this hematoma. The rupture in the kidney now presents itself. It extends from the lower pole into the pelvis and the ragged edges of the tear bleed rather freely (Fig. 38, *a*). After cleansing the whole cavity by a liberal irrigation of hot decinormal salt solution we shall proceed to the closure of the renal wound.

It is to be kept in mind that the renal tissue, especially if suffused, does not lend itself easily to suturing. Either the sutures are tied loosely, and then the hemorrhage is not checked with any degree of reliability, or if the sutures are knotted under pressure sufficient to control the hemorrhage, they are apt to cut through the renal parenchyma.

This dilemma is avoided by transplanting perirenal fat over the site of the sutures. In this way the hemostatic qualities of the fat are utilized and the transplant furnishes a good padding, the sutures running first through the fatty flap and then through the kidney substances (Fig. 38, *b*, *c*). The sutures may be tied with all the energy necessary for good coaptation and definite checking of the hemorrhage.

After the renal repair is finished a cigarette drain is inserted and the wound closed down to the drain.

#### CASE II.—NEPHROLITHIASIS

The next case is also very interesting because it allows a revision of the technical results of a pyelotomy executed after the kidney was exposed through a muscle-splitting incision. The pyelotomy wound was closed with a transplant of perirenal fat after the method employed in the first case. The patient made an uneventful recovery. Recently, however, he has had a return of the kidney symptoms, and x-ray examination shows the presence of a stone in the kidney. As he complains rather severely and the objective symptoms are serious, we have decided to reoperate.

We are making the usual flank incision. The penetration to the kidney furnishes evidence that the readaptation of the muscles and fasciæ was perfect and that no cicatricial distortion or undue fixation of the kidney has occurred. The transplant of fat still covers the pelvis of the kidney. In order to open the pelvis for removal of the concretion we will simply detach the flap of fat on one side and then clap it to the other side, just as one would open a door. The renal pelvis is now incised and the stone removed. We are closing the slit in the pelvis with two fine catgut sutures. The fatty flap is replaced over the pelvis



and fastened there by the ends of the closing sutures which are brought through the free edge of the transplant.

These findings prove that the muscle-splitting approach to the kidney and the reinforcement of the pelvic wall by the transplantation of fat furnish ideal technical results. In contradistinction to this, the next case will demonstrate the untoward results of cutting crosswise the muscles covering the kidney and the splitting of the renal parenchyma in order to extract a concretion.

### CASE III.—NEPHROLITHIASIS

This patient was nephrotomized several years ago for a renal calculus. He returns to us now because of a recurrence of the old trouble.

The whole right renal region is swollen and very sensitive, and the urine is packed with pus, blood, and detritus. The patient suffers from constant pain, which is occasionally accentuated by paroxysmal exacerbations. Cystoscopy and ureteral catheterization shows the left kidney to be normal, while the right furnishes all the blood and pus. *x*-Ray examination shows several dendritic concretions in this kidney.

The patient is now prepared for operation. As one must anticipate that the old scar will offer difficulties in dissection, it is contoured by an elliptic incision and further progress in the deeper tissue is attempted by dissection from this new incision. It is with great difficulty that we detach the superficial layers, as the skin, subcutaneous fat, and muscles are glued together by very vascular cicatricial tissue. The kidney proper is also intimately connected with the cicatricial composite covering it, and the adhesions forming this conglutination are very vascular, so that the exposure of the kidney can only be accomplished step by step. The whole kidney is mushy and its surface is studded with small abscesses and hemorrhagic spots. Palpation of the organ gives the sensation of various hard masses embedded in the parenchyma and crepitation all through the kidney. This makes it evident that as an excretory organ this kidney has passed all usefulness, and we will, therefore, remove it.

It is fair to assume that at least the greater part of the pathology encountered is due to the method employed in the first operation. The cutting of the muscles led to the formation of extensive scar tissue at the point of severance, while this scar tissue, very probably, in its contraction interfered with the circulation inside of the kidney. The incision in the renal parenchyma necessarily led to cicatrization in the renal parenchyma, again hampering the renal circulation. The incomplete hemostasis secured by simple sutures only without the aid of a transplant of fat permitted the deposition of numerous coagula throughout the renal substance adjacent to the incision, these coagula very likely forming the nuclei for the disseminated lithiasis. The circulatory disturbances combined with the calcareous deposits finally led to the invasion and colonization of pyogenic germs, which events brought about the destruction of a kidney which might have been saved by the employment of a method based on more refined details of execution.

#### CASE IV.—IMPACTED URETERAL STONE

This case is of some diagnostic interest. The patient complains of symptoms which, as a rule, are ascribed to renal lithiasis, namely, occasional sharp pains in the kidney region, lancinating downward into the scrotum, polyuria following these attacks. The urine is cloudy and shows under the microscope pus-cells and red corpuscles.  $\alpha$ -Ray examination of the kidney is negative, but a pelvic Roentgen picture shows a longitudinal shadow in the vesical region.

Cystoscopy shows a normal bladder mucosa. If the beak of the cystoscope is pushed back in the fundus of the bladder and then turned for 90 degrees to the right, so that the intramural part of the ureter is exposed to transillumination, the intravesical part of the ureter appears to be occupied by a dark shadow.

From the cystoscopic findings a diagnosis of concretion in the lowest part of the ureter is made. This assumption is confirmed by the introduction of a cystoscope for ureteral catheterization.

The right ureteral mouth is brought into focus, a metallic sound is passed through the cystoscopic channel and introduced into the ureteral opening. About  $\frac{1}{2}$  cm. above this opening the sound is arrested and conveys to the examining hand a grating sensation.

The therapy will consist, first, in an attempt to deliver this ureteral stone into the bladder by endovesical manipulations, dilating the ureteral mouth by means of an alligator forceps introduced through an operating cystoscope. If this should prove insufficient, the circumference of the ureteral mouth will be nicked with the tiny shears of the operating cystoscope, followed by an attempt to extract the stone with an appropriate forceps, and pumping out of the liberated stone by means of a Bigelow pump. In case all these endovesical procedures should fail, the bladder will be opened by a suprapubic incision, the ureteral mouth and the adjacent vesical mucosa will be incised, and the stone freed and removed.

#### CASE V.—SYPHILIS OF THE BLADDER

The last case to be presented and discussed represents a type of vesical pathology which, although not so infrequent, is quite often misinterpreted, very probably because the possibility of such an occurrence is not thought of.

The patient, a male of about forty years, complains of frequent shooting pains in his bladder. While during the day the urinary calls are not so frequent, they become bothersome in the warmth of the bed. The urine is quite often cloudy and will clear up again even without any medication. Microscopic examination of the urine does not show any kidney elements, but large epithelial cells, very few pus-cells, and much nondescript detritus.

On cystoscopic examination the fundus and vertex of the bladder are clear. The trigonum is of a brownish color throughout. Near the intra-ureteric ligament are two well-circumscribed gray spots, each the size of a lentil. Both these spots appear to be somewhat prominent and are surrounded by a narrow zone of bright red color.



In order to scrutinize more thoroughly the surface of these patches the window of the cystoscope is brought as close to them as possible, so as to take advantage of the magnifying power of the lens system at close proximity to the object to be observed. The surface of the patches appears now to be corrugated, its appearance reminding one of the surface of the paper squeegees used for cleaning a blackboard.

The observer is struck by the similarity of the picture furnished by broad condylomata on other parts of the body, and a diagnosis of a syphiloma of the vesical mucosa is made. In fact, upon close examination the patient gives a history of syphilis acquired and somewhat loosely treated about ten years ago. There are adenopathies in the exterior sulci of the elbows and in the armpits. Laboratory tests and efficacy of antiluetic treatment will round out the clinical picture.

# CLINIC OF DR. CHARLES MORGAN McKENNA

## ST. JOSEPH'S HOSPITAL

### REPORT OF THREE CASES

*Summary:* Case I.—*Suprapubic prostatectomy:* Patient giving typical symptoms of prostatic hypertrophy; cystoscopic examination; pre-operative treatment; suprapubic prostatectomy under local anesthesia—technic—necessity of careful closure of bladder wounds—advantages of glass drainage-tubes in these cases.

Case II.—*Short circuit of the vas deferens:* Anastomosis of vas to epididymis for relief of sterility; use of silver wire to ensure a patent lumen.

Case III.—*Tuberculosis of kidney—nephrectomy:* Recurrence of frequent urinations following double castration for testicular tuberculosis; cystoscopy and examination of catheterized specimen confirms diagnosis of tuberculosis of kidney; removal of kidney—treatment of ureter.

October 31, 1918.

#### CASE I.—SUPRAPUBIC PROSTATECTOMY

WE have 3 cases this morning, all of which I think will prove interesting to you. The first is a prostatectomy, with the following history:

This patient, Mr. R., was referred to me about one month ago. He is seventy-five years of age. Venereal history is negative. His habits have been very regular and his life, you might say, a most regular one throughout. About one year ago he began to notice frequency of urination. This, he says, was first brought to his attention while riding in a machine, and he thought at first it was due to the jarring, but a little later on he noticed that he had to get up frequently during the night. For a time the frequency subsided, and then a little later returned. About six or eight weeks ago the frequency increased in severity, becoming so pronounced that he could scarcely get any sleep.

You notice that his physical condition is very good, and I believe he will make a very satisfactory recovery from the opera-

tion. I sent him to the hospital about ten days ago. At this time the bladder contained about 500 c.c. of residual urine. On cystoscopic examination the bladder looks perfectly normal. Neither the catheterized specimen of urine or the passed specimen show the presence of infection. On entrance to the hospital his blood-pressure was 178. He has been catheterized on an average of three times during the twenty-four hours, and we find this morning that his blood-pressure has dropped to 160. I state this specifically, because I do not think it is necessary to do a two-step operation in this case. So much has been said about the two-step operation that I believe its value in cases of long-standing bladder or kidney infection, or where the blood-pressure is high, is very well understood. I think that for his age this patient is a very good risk. However, I am going to do most of the operation under local anesthesia, using  $\frac{1}{2}$  of 1 per cent. novocain solution.

I am doing a nerve-blocking operation, using a small hypodermic needle for the skin and changing to a larger needle for the deeper tissues. Patients of this age do better with a local anesthetic than with a general, and the after-treatment is more easily carried out. These old people do not do well under any kind of general anesthetic. It may be necessary for us to finish the operation with gas.

We have completed the injections and again paint the abdomen with tincture of iodine and proceed in the same manner as if the patient were asleep. While waiting for the tissues to become fully anesthetized we will fill the bladder with boric solution, so that it will be distended and can obliterate the perivesical space. This will make it easier for us to enter the bladder and will lessen the chances of injuring or cutting the peritoneum. You notice I am leaving a large catheter in the urethra closed with a hemostat. This catheter plays a most important part in the technic later in the operation.

Now we are making a suprapubic incision, and you notice that the patient complains of no pain. We are down to the external peritoneum. If he has any pain during the operation, it will be at this point, because the peritoneum is very sensitive.



I have asked the patient to tell me when he feels pain, because if it is too severe, we will not continue the operation under local anesthesia. I am using a dry sponge to push the fat up and away from the bladder and to strip back the peritoneum. I am doing this gradually so as not to cause pain. You see that the bladder is very well exposed. The students have asked me many times how I can tell the difference between the appearance of the bladder and the peritoneum. The chief difference is in the color and the number of well-distended blood-vessels on the surface of the bladder, which are not present on the peritoneum. I make quite a point of having the fat well off the area in the bladder which I am about to incise, because it plays such an important rôle in the repair of the tissues. I am putting in two silk guy-ropes into the bladder, on each side of which I intend to make my incision. They will hold the bladder well in place. Now the assistant removes the hemostat from the catheter in the urethra. By so doing the fluid in the bladder can be withdrawn and I can open the bladder without having its contents run all over the open wound and on to the abdomen, a condition which is very annoying both to the patient and the operator. In fact, it makes the operation a very mussy one. A good many bladder operations are done under circumstances of this kind. I cannot put too much stress on this point. The guy-ropes hold the bladder up well and it is not necessary to have the fluid in the bladder. Hence I use the catheter in the urethra.

I will now make an incision about 2 inches long in the bladder. This bladder is very thick. I am putting a suture at each end of the bladder incision so as not to tear it. Many times in making an incision in the bladder the lower angle is torn well under the pubic bone. It is very difficult to suture this tear and frequently the urine seeps into this space, producing an infection which is not recognized, and no drainage is instituted.

The next step is to expose the prostate. I am going to inject the capsule of the gland with novocain solution. The patient has experienced no pain so far in the operation. Before

attempting to shell out the prostate, however, we will give him a little gas. Now, with the retractors in place and the electric light attached, I can see exactly what I am going to do. I am using a little different technic in this operation from the one usually employed. I am making a circular incision about the urethral opening, which includes the anterior and posterior sides of the prostate. I have now a well-defined cleavage of the prostate both anteriorly and posteriorly (Fig. 39, *a*). I can now introduce my finger between the capsule and the gland proper and separate it very rapidly. I am going all the way around posteriorly and bringing my finger up anteriorly. I roll that one finger on either side of the urethra anteriorly and separate the prostate proper from the anterior mucous membrane (Fig. 39, *b* and *c*). In doing this I am trying to save as much of the mucous membrane as I possibly can. By so doing I have the prostatic urethra fairly well separated from the gland proper, and when I cut it off I will have a cuff of the urethra to attach to the mucous membrane. You notice this gland is intact and removed in one piece. Now the point I would like to have you observe is the small amount of hemorrhage that has taken place so far, and as the mucous membrane falls into the prostatic space it covers nearly the entire space. I am going to use some hot irrigations to remove the large clots and débris which may be in the bladder. We will now dry out the space with a sponge on a long stick. These sponges are made especially for this work. They are round and just fit into the space from which the prostate has been removed. You observe that we have scarcely any hemorrhage. In fact, it will not be necessary to use an artery forceps in the bladder. I am putting in three stitches, one on each side, uniting the anterior and posterior mucous membranes of the bladder (Fig. 39, *d*). It is not necessary to put this stitch into the urethra, but I think it will help to make a firmer union than if we allow the wound to granulate of itself.

We will stop the gas anesthetic, as the tissues are sufficiently anesthetized from the novocain to enable us to finish the operation without causing the patient any pain. The drainage-tube

has already been prepared. A No. 2 chromicized catgut suture is placed through the tube wall about 2 inches away from

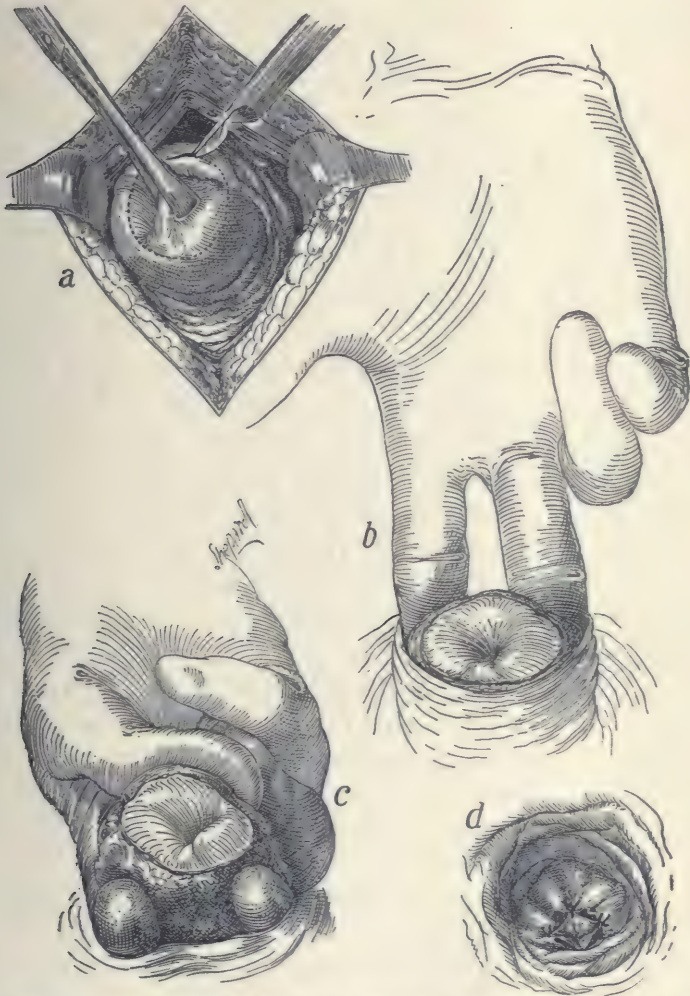


Fig. 39.—Suprapubic prostatectomy: *a*, Prostate pulled up and mucosa incised; *b*, *c*, prostate shelled out with fingers; *d*, mucosa sutured.

the end introduced into the bladder. We always insert the tube at the upper angle of the bladder incision and suture it to the wall of the bladder. We will put in a number of interrupted



chromicized catgut sutures in the bladder, closing it up to the tube. I always pay particular attention to the closure, suturing each layer from the bladder out to the skin, making it watertight up to the tube. To make the incision absolutely waterproof I am putting in a continuous suture over the interrupted ones in the bladder. I have never experienced any difficulty with leakage where this method has been employed. We will not put a drain in the perivesical space. I sometimes believe that a drain in the perivesical space does more harm than good, because oftentimes infection is carried into that space that would otherwise not reach it. I feel that the sutures in the bladder are sufficient to prevent leakage into this space. We are accurately closing the muscle and fascia up to the tube. The skin is closed with horsehair. As I have said in some of the previous clinics, I am placing the skin sutures well back from the incision so as to avoid keloid formation. I am quite certain that placing the sutures too close to the margin of the wound is a cause of keloid formation following operation.

This right-angled glass tube, which I am holding, is made especially for this work. The long end of the glass tube ( $2\frac{1}{2}$  inches) is placed in the rubber tube, extending inside the rubber well beneath the skin and muscle. I always introduce this tube myself to be absolutely sure that the rubber tube does not bend on itself, because many good operations have been spoiled by the tube simply bending over on itself, obstructing the drainage, and causing a general infection from the bladder out to the skin. When the patient is taken back to his room the assistant will attach a rubber tube to the distal end of the glass elbow-joint for bedside siphonage drainage, which process is familiar to you. This keeps the wound and abdomen clean. This is most disastrous to the patient, delaying the convalescence and endangering his life. We must not forget that we are dealing with old men whose resistance is low, and every precaution must be taken not only in the operation but in the after-treatment.

I shall take great pleasure in having you see this case in four or five days, and I am quite certain that, provided no infection occurs, the abdomen will be clean and the patient will still be

wearing the dressings applied today. There will be no drainage outside of the tube and no foul-smelling urine. That, I think, means so much to these patients, because they need the best atmosphere following operation that we can possibly give them.

#### CASE II.—SHORT CIRCUIT OF THE VAS DEFERENS

This patient, M. S., aged thirty-four years, has been married for eight years and has no children. He gives a history of having had a double epididymitis eleven years ago following a Neisserian infection. An examination has been made for spermatozoa, which was negative. Without going into a discussion of the anatomy, I am going to do a short circuit of the vas with the epididymi.

I am changing my technic from that employed a few years ago. First we will cut down on the vas about 2 inches above the testicle. The cord is now exposed, and we will separate the vas by palpating the cord between the finger and thumb. Because of the consistency and color the vas is easily located and exposed. With a fine knife or bistoury an incision is made into the vas and a 10 per cent. argyrol solution injected. If the lumen is patent a black urine can be withdrawn from the bladder. Now we will introduce a small silver wire into the lumen of the vas, permitting it to remain in place with about 4 inches exposed at the point of opening in the vas. I used to bring the wire out through the wall of the vas and draw it through the skin, but that causes too much traumatism to the vas itself, so we will bring it through the point of anastomosis with the epididymis and out through the skin opening (Fig. 40).

I will next open the epididymis at about the middle third. We first look for free spermatozoa, which you can see are very plentiful, looking like pus mixed with blood. Two sutures of 00 chromicized catgut are used for the anastomosis. The silver wire is brought through the epididymis and out through the skin wound (Fig. 40). The skin is closed in the usual manner and the wire protected by gauze. The wire can be removed in four or five days, thereby leaving an opening into the vas. If the wire is not used the lumen fills up and is occluded with a

blood-clot which becomes organized, so that the operation is of no value.

The other side will be operated in the same manner. Make the incision just long enough to expose both vas and epididymis.

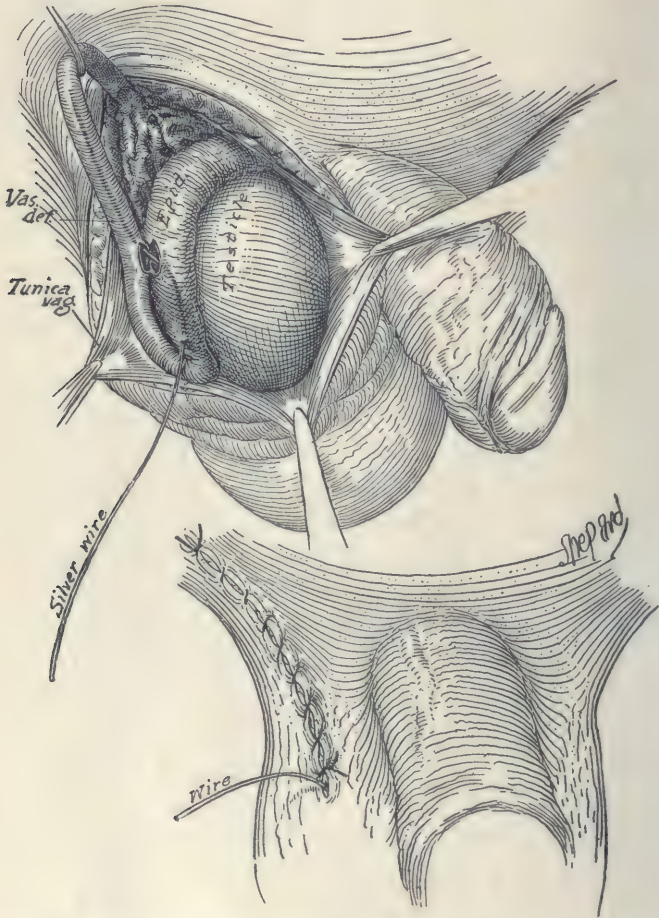


Fig. 40.—Short circuit of the vas deferens; anastomosis of vas and epididymis; placing of silver wire.

You will remember that the obstruction to the spermatozoa occurs usually in the globus minor.

We will report on the success of this case at a later date.



**CASE III.—TUBERCULOSIS OF KIDNEY—NEPHRECTOMY**

The next case is a rather interesting one. Mr. S., aged twenty-seven, single, a civil engineer, was referred to this clinic because of frequent urination. He had a double castration performed three years ago, both epididymi and testicles being removed. He says the diagnosis at the time was tuberculosis of both testicles. At the time of operation he was troubled with frequent urinations, which have gradually become more severe.

Cystoscopic examination shows a marked cystitis in the trigone, and especially well marked about the orifice of the right ureter. Cultures made from the catheterized specimen of urine show a great many tubercle bacilli. The bladder was well irrigated and a ureteral catheterization done. The urine from the right side shows a great number of tubercle bacilli present, while that from the left side is normal. He complains of pain in the right side and palpation of the right kidney elicits considerable pain. He gives all the typical symptoms of a right-sided tuberculosis.

I am going to cut down on the right side and remove the kidney. You notice that I am dividing Petit's triangle and elongating it toward the brim of the pelvis, so as to remove the ureter with the kidney. You can see the perinephritic fat, or the fatty capsule. The patient is so thin that it will be easy to deliver the kidney. I have mentioned before that the delivery of the kidney is one of the most important steps in the operation, especially in doing a nephrotomy or removing a stone from the kidney, where the kidney is incised but not removed. I sometimes think that we cause so much trauma in these operations that the kidney is left in a serious condition. You see this is a fairly large kidney without much swelling at any particular place, but, inasmuch as the urine from this side showed the presence of numerous tubercle bacilli, we know the organ is tuberculous and should be removed. I am ligating the vessels first separately, then both together, using chromicized catgut.

We will now dissect out the ureter and tie it off close to the bladder wall. The easiest way to locate a ureter when not following it down from the kidney is to lift up the peritoneum

at the bifurcation of the iliac artery and roll the ureter over your finger. The ureter is now ligated. I will place a small cigarette drain at the lower angle of the incision, and close the wound with interrupted catgut sutures and the skin in the usual manner.

On splitting the kidney you see the tuberculosis in its different stages. The cavity here is well marked and shows an old infection, while the area below and close to the pelvis is partially broken down. The bright red areas show active tuberculosis. A microscopic examination will be made.

## CLINIC OF DR. MAXIMILIAN J. HUBENY

CHICAGO POLICLINIC HOSPITAL

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### ROENTGENOLOGIC DEMONSTRATION OF SEVERAL UNUSUAL CONDITIONS OF THE GENITO-URINARY TRACT

*Summary:* The Roentgen ray as a diagnostic aid; report of 3 cases in which the roentgenologic examination showed the presence of unusual conditions in the genito-urinary tract; bibliography.

THE Roentgen ray as a diagnostic factor is an accepted adjunct to our already heavily laden armamentarium. Its diagnostic aid is so useful that its universal employment as a routine method should be one of the first procedures thought of. Its convincing disclosures are sometimes so complete and so surprising as to immediately make a non-obvious lesion or etiology an obvious one. Tangibilities often replace sophistries, with the subsequent institution of correct treatment, thereby shortening the convalescence of the patient, which necessarily enhances the prognosis.

Most of the following cases are relatively rare, and the employment of the Roentgen method of diagnosis in these particular instances assisted very materially in accounting for the symptomatology.

**CASE I.**—Referred by Dr. A. H. Waterman. Male, aged seventy-one; no venereal history; no special previous ailments bearing on present complaint.

*Present Complaint.*—Frequent desire to urinate, with feeling of incomplete evacuation. This has been present for about ten years. There is a marked feeling of fulness after eating, with a gradual loss of weight covering a period of four years. Normal weight is 215 pounds, while present weight is only 174 pounds.



On examination, the abdomen is flabby and pendulous. Palpation reveals a tumor mass in the suprapubic region extending as high as the umbilicus. There was slight fluctuation, but no succussion was obtainable. Digital examination revealed a large prostate. Examination of the urine was negative. A clinical diagnosis of lipoma was made.

A Roentgen examination following the administration of an opaque meal was made in the hope that important information would be obtained. The most interesting findings were exhibited six hours after the administration of the opaque meal, at which time the barium was contained in the jejunum and ileum. The contour was such as to indicate the presence of a hydrostatic tumor because of the semicircular conformation. Usually the terminal ileum lies in the true pelvis, but in this instance it was forced up beyond the pelvic brim as high as the promontory of the sacrum. A tentative diagnosis of patent urachus was made. Catheterization was unsatisfactory. Up to this time no cystoscopic examination had been made. When this was done, 39 ounces of residual urine were obtained. As soon as the residual urine was withdrawn the tumor mass completely disappeared.

The interesting features in this case are the peculiar and significant roentgenogram and the paradox of negative urine with such marked residual urine. The conditions making the latter possible must have existed for a long time. Prostatectomy gave complete relief.

CASE II.—Referred by Dr. Espy L. Smith. Male, aged forty-six. History of venereal infection sixteen years previous. Has always had a sensation of incomplete urination with occasional attacks of cystitis.

*Present Complaint.*—Acute and complete retention of urine.

Palpation revealed a large distended mass in the suprapubic region. Digital examination of prostate was negative. At the time of presentation of patient catheterization was unsatisfactory, only a few drops passing at a time. A Roentgen examination, similar to the one made in Case I, was performed, with the same parallel features resulting, whereupon a bladder retention

was diagnosed, regardless of the inability to void only a little urine even with catheterization.

Before cystoscopic and other examinations could be made the patient exhibited marked toxic symptoms, necessitating im-



Fig. 41.—Ileum lifted out of pelvis by a distended bladder. In one case this was due to retention because of large prostate; in another case the retention was due to a mucous fold between two lobes of the prostate.

mediate surgical interference. A suprapubic incision was made into the bladder, followed by the voidance of a large amount of urine. Examination revealed a vesico-urethral barrier,

which appeared to be a simple fold of membrane, smooth, thin, and almost transparent, extending from one lobe of the prostate to the other. Because of the depressed state of the patient no further surgical work was done. Convalescence was uneventful. Catheterization was done during this period with a continuation of self-catheterization by patient since that time.



Fig. 42.—Normal bladder distended with air.

The interesting feature in this case was the ineffectual passage of the rubber catheter at the time of the original examination, the eyelets of which came in contact with the mucous fold, thereby causing an obstruction to the outflow.

CASE III.—Referred by Dr. Phillip Kreissl. Male, aged thirty-four. Gonorrheal infection three years ago. Complains of frequent and interrupted urination, sometimes in six or more phases, with pain in lower abdomen and right lumbar region. He



never had symptoms of vesical distress before contracting gonorrheal urethritis. The urine was foul, cloudy, contained pus and red blood-cells, and an abundant amount of colon bacilli and



Fig. 43.—Air inflation of bladder, showing diverticulum verified by injection of cagentos, also cystoscopic examination.

staphylococci. A catheter was inserted in the bladder immediately after urination and 120 c.c. of cloudy urine withdrawn. Cystoscopic inspection showed a mild chronic cystitis, slight trabeculation of the bladder wall, and a diverticular opening

in the posterior wall about 1 inch behind the right ureteral orifice. Upon exerting a downward pressure by forced coughing a milky fluid was observed emanating from the diverticulum. On in-



Fig. 44.—Air inflation of bladder, showing diverticulum, verified by injection of cagentos, also cystoscopic examination.

roducing the beak of the cystoscope into the sac, its walls could distinctly be seen to be chronically inflamed. Clear urine was obtained through a catheter which was readily introduced into the left ureter. However, when passing the instrument on the

right side a decided resistance had to be overcome in the pelvic portion of the ureter, and cloudy urine was obtained from the corresponding kidney. This urine showed evidences of pyelitis.

A roentgenogram with a shadowgraph catheter in this ureter showed its pelvic portion turned downward and outward from its normal course.



Fig. 45.—Bladder filled with cargentos, shadow within a shadow, showing diverticulum verified by air inflation, also cystoscopic examination.

To fortify the above information inflation of the bladder with air was performed and stereoscopic roentgenograms were taken—one set with the patient prone and the other set with the patient supine. The diverticulum was plainly demonstrable. Following this, cystograms (injection of bladder with cargentos) were made, again verifying the presence, location, and extent of the diverticulum. Operation gave complete relief.

CASE IV.—Referred by Dr. Robert A. Herbst. Male, aged



twenty-one, single. Occupation schoolteacher. States that he has had incontinence of urine since puberty. This has been both diurnal and nocturnal, and more marked upon exertion. For the last three or four years he has been troubled with frequent and imperative urinations. Sometimes the urinary evacuation felt incomplete.

Upon examination the external genitalia were found to be normal. Rectal examination revealed prostate gland normal



Fig. 46.—Bladder filled with cagentos. Shadow within a shadow, showing diverticulum verified by air inflation, also cystoscopic examination.

in size and consistency. Seminal vesicles were palpable. The catheterized urine was acid in reaction. Specific gravity was 1025, albumin was present, but no sugar. The sediment contained many red cells, some pus, and mobile bacteria. Stained smears from sediment showed pus-cells and ordinary pus cocci. Cystoscopic examination revealed a marked trabeculation of the bladder and a generalized reddening and injection of the entire mucosa. The ureteral orifices were distorted and asymmetric-

ally placed. Cystography revealed an asymmetric bladder with a large patulous and redundant right ureter, which permitted the inflow of the thorium into the pelvis of the kidney, the lower



Fig. 47.—Sacralization of transverse process of fifth lumbar vertebra. Asymmetric sacrum with deviation. Figs. 48, 49, and 50 illustrate the same case.

margin of which was visible on the plate. A second similar examination was done several weeks later for the express purpose of getting the renal pelvis, but, to our amazement and disap-



Fig. 48.—Injection of bladder with thorium solution, showing asymmetry, with patulous, distorted, and redundant ureter, permitting a reflux into the pelvis of the kidney. Patient face up.

pointment, no opaque material entered the ureter. It was then decided that a third examination with ureteral catheterization



be done, but it was impossible to pass the opaque catheter, thereby preventing the taking of a pyelogram.

The instructive value of this case is, first, the possibility of urogenic infection of the kidney by reflex of urine; second,

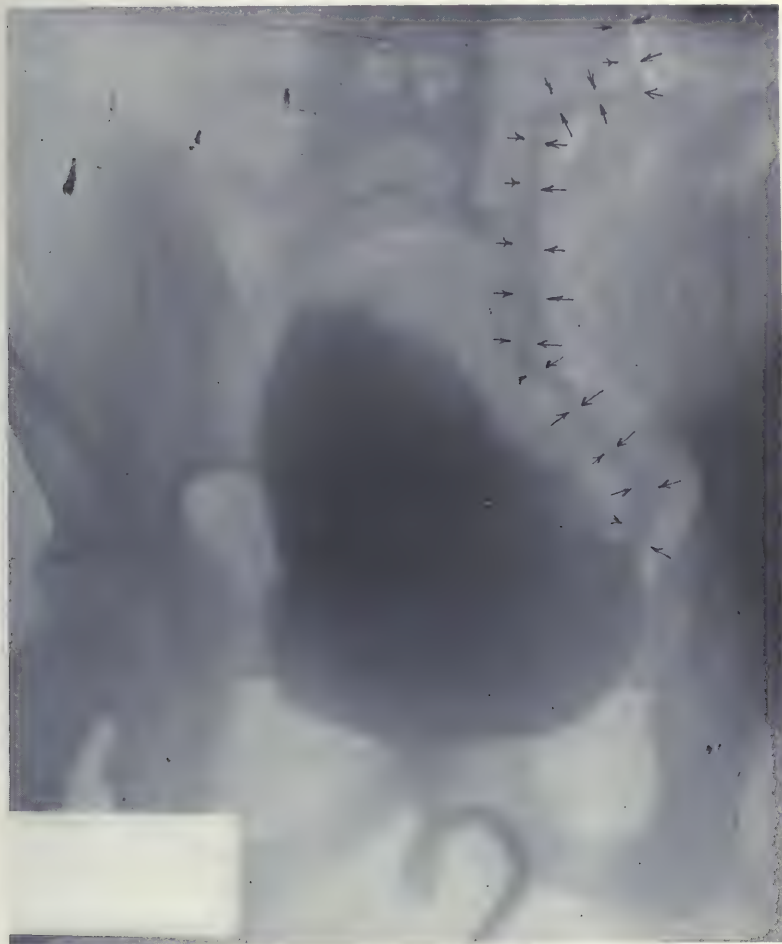


Fig. 49.—Same as Fig. 48. Patient face down.

the redundant ureter occasionally kinking with a consequent retention of urine proximal to the kink, then after straightening of the kink the passage of residual urine; third, the association

of anomalies. Oftentimes where one anomaly exists others are liable to be present. In this instance the roentgenogram also showed a marked asymmetry of the sacrum with sacralization of the right transverse process of the fifth lumbar vertebra.



Fig. 50.—Multiple prostatic calculi. Up to time of present writing massage of prostate liberated twenty-three stones.

CASE V.—Referred by Dr. Walter Venn. Male, aged fifty-seven, excellent physical condition. Had measles during childhood; pneumonia at fifteen years of age; typhoid at thirty-five, and gonorrhea at twenty years of age.

*Present Complaint.*—Frequency of urination began about two years ago. Recently he has had occasional attacks of inability to urinate, with burning on urination, but not before or after the act. A constant desire to urinate was not present. The frequency has gradually increased until at the present time it is six or seven times during the day and two or three times at night. He passes but a small quantity of urine at a time. About two months ago, following a fall, he was unable to urinate from 2 o'clock in the afternoon until late at night. A catheter was used at that time, but not since.

Examination showed the external genitals negative. Reflexes were good. Prostate was greatly enlarged, smooth, regular and even, with no nodules or tender areas. Seminal vesicles were not palpable.

Blood examination showed 7500 leukocytes and 58 per cent. hemoglobin. Blood-pressure was 128 systolic and 68 diastolic. Urine was bloody, with a specific gravity of 1020. There were few epithelial cells, many red blood-cells, a few leukocytes, and no bacteria. Culture of the urine was negative.

The roentgenograms showed the presence of many calculi (54 could be counted on the plate) situated medially and suprapubically, corresponding to the usual location of prostatic stones. Chemical analysis by Dr. R. W. Webster showed the predominance of calcium carbonates. A roentgenogram of a few of the calculi which were expressed after prostatic massage showed that a fusion of several smaller calculi had taken place.

In referring to the Bibliography, no citation was found presenting the features of Cases I, II, and IV, in which the Roentgen method of diagnosis was applied to assist in the determination of a diagnosis. According to the best knowledge of the writer these cases are original in presentation.

The other two cases, while unique and interesting, are amply discussed in the appended Bibliography.

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## CLINIC OF DR. GEORGE E. SHAMBAUGH

### PRESBYTERIAN HOSPITAL

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## DIAGNOSIS AND TREATMENT OF CERTAIN OTOLARYNGOLOGIC CONDITIONS

*Summary:* Case I.—*Acute mastoiditis with infection of deep-seated pneumatic cells:*

Patient giving history of a discharging ear of five weeks' duration; examination—*x-ray* findings—bacteriologic report; diagnosis; operation eight weeks after onset—condition found at operation; usual mastoid operation performed.

Case II.—*Disturbance of equilibrium:* Patient having disturbance of equilibrium as the result of a blow on the temple one year before; also partial deafness, the result of a previous accident; examination; diagnosis of functional neurosis supported by neurologic findings.

Case III.—*Vertigo caused by intracranial disease presenting the Ménière symptom-complex:* Dizziness, head noises, and defective hearing in a man of thirty years, developing apparently without cause two years before; results of examination of hearing and of vestibular mechanism suggest a lesion developing in the cerebellar pontine angle, interfering with the function of the eighth nerve.

Case IV.—*Squamous-cell carcinoma of the larynx:* A man, aged sixty-five, giving a history of hoarseness coming on insidiously two years before; two months before examination patient was operated on for a carcinoma of the large intestine; examination revealed a tumor formation at the anterior commissure; microscopic examination of removed growth showed it to be a squamous-cell carcinoma; later the thickened tissue in the larynx was removed with the galvanocautery.

Case V.—*Laryngeal papilloma:* A man of sixty years with loss of the speaking voice developing nine months before; diagnosis—a benign papilloma of the larynx; differentiation from a malignant growth and from tuberculosis; methods of removing such growths—technic in present case; prognosis.

### CASE I.—ACUTE MASTOIDITIS WITH INFECTION OF DEEP-SEATED PNEUMATIC CELLS

THE case is that of a man thirty-six years of age, who consulted me in April, 1915, because of a discharging ear, which had developed five weeks before. For two weeks after the acute onset he suffered more or less from severe pains over the left side

of the head and neck. Since that time he had had very little discomfort, and was sent to me because of the persistence of rather profuse purulent discharge. There was no elevation of temperature, and the patient stated that he had been watching this himself every evening, but had not as yet discovered anything above the normal.

We found, on examination, that aside from the purulent discharge the fundus of the canal was very much contracted; not as a distinct sinking, however, of the upper posterior wall, which is so characteristic of some cases of mastoid abscess. None of the landmarks of the drum membrane could be detected. The mastoid was small in outline; there was no evidence of infiltration or edema over the mastoid region, and only one or two points where the patient admitted having any more discomfort on deep pressure than on the opposite side.

The skiagraph which we had made disclosed a small mastoid; a shadow over all the pneumatic spaces; a rather suspicious shadow near the tip, which might have been either the result of a softening or of a deep-seated cell filled with pus.

Bacteriologic examination showed staphylococci only.

The duration of the profuse discharge, together with the findings of the contracted canal, suggested very distinctly a type of mastoid disease which would have to be treated surgically. The patient, however, because he was not feeling ill did not have a rise of temperature, and was experiencing very little discomfort in the region of the ear, was not inclined to accept the advice to have the mastoid cleaned out. This condition ran on for three weeks longer, showing very little change during this time. One week after we had seen him he returned to the city and admitted that he had been having enough discomfort in the ear for several days to keep him away from business. It was not until the end of the eighth week after the onset of the ear trouble that distinct infiltration appeared over the region of the mastoid process. This was associated with a great deal of discomfort. The result was that the patient reported to us again, and was then quite willing to accept our advice to go to the hospital and have the mastoid cleaned out.



A fistulous opening was found over the tip. The mastoid process itself was very small. A great deal of softening had already taken place in the bony tissue. After removal of the tip, opening into the antrum and cleaning out of the remainder of the mastoid process, pus was seen to be oozing up from a region in the bottom of the mastoid wound, rather close to the external auditory canal and above the region of the tip of the mastoid. Using a curet in this region, we opened into a large cell, which, because of its depth, was recognized to be internal to the digastric groove. This cell lay in the region of the shadow which was shown in the skiagraph, near the tip of the mastoid. The detection of this deep-seated abscess was facilitated by the presence of pus which oozed up in the bottom of the mastoid opening. The usual mastoid operation for an acute mastoiditis does not include the exploration of the bony substance internal to the digastric groove.

#### CASE II.—DISTURBANCE OF EQUILIBRIUM

The patient is a man forty-one years of age, who consulted me in April, 1917. He complained that he was unable to work in a factory, where he had been employed for several years, because of marked disturbances in equilibrium. This condition had followed an accident in the factory sustained about a year before he consulted me. He had been struck a blow on the right temple region which had rendered him unconscious for a short period. Since then he has been incapacitated for his work. Has suffered from rather severe headaches, especially over the right side of head and occiput, these headaches coming on in attacks two or three times a week.

His disturbance in equilibrium, which seems to constitute his chief difficulty in carrying on his work, consisted of a tendency to fall, which appeared to be as much in one direction as in another. At times there seemed to be very little of this disturbance, but at other times it became very much exaggerated. There has been no nausea connected with the attacks, nor was I able to get a history of any distinct symptoms of vertigo. The patient states that he had been somewhat hard of hearing for

three years, during which time he had suffered somewhat from tinnitus aurium. This disturbance in hearing he attributes to another accident, which he had sustained three years ago. The physician who referred the case to me believed that there was possibly some injury to the internal ear which accounted for his disturbances in equilibrium.

Examination disclosed nothing abnormal in the nose or throat. The drum membranes in both ears were rather sharply retracted. The functional examination of the hearing disclosed a moderate defect in the hearing, about the same in both ears. Bone conduction was shortened; the Rinné was positive, and the defect in the hearing was more at the upper end of the scale for both the Galton whistle and the  $c^4$  tuning-forks. The characteristics of the defect in hearing were those of a degenerative process involving the internal ear and were apparently not the result of the tubotympanic catarrh which had caused the retraction of the drum membranes.

In examining the vestibular apparatus we noted that there was no spontaneous nystagmus. The spontaneous pointing tests showed a past-pointing to the left for the right hand 1 to 2 inches and for the left hand 3 to 4 inches. After rotation the nystagmus appeared about normal, twenty-three seconds' duration to either side. The past-pointing after rotation failed to give entirely normal responses. For example, after rotating to the right instead of past-pointing to the right both hands past-pointed a few inches to the left. After rotating to the left we got the normal past-pointing to the left for both the right and left hands. In making the Romberg test the characteristic symptom of falling came out very distinctly. When the patient would attempt to stand he would lurch now in one direction, now in another, sometimes to the right, sometimes to the left, sometimes forward, even with the eyes open. His falling presented none of the characteristics of the falling associated with disturbances of the vestibular mechanism, but from the exaggerated character of the symptoms they suggested at once that it was the result of a neurosis.

The fact that a personal injury case was pending also gave

reason for suspecting a functional, although not necessarily a conscious, exaggeration of symptoms. It was quite clear that the patient had not sustained an injury to the internal ear which could account for vertigo.

Vertigo which follows an injury to the internal ear is the vertigo associated with a disturbance in equilibrium caused by the sudden destruction of the end-organs in one ear, and the unbalance which this occasions. Such a vertigo is most severe when the injury occurs, but gradually improves, and long before a year elapses has entirely disappeared. The fact that the patient still has good hearing in both ears shows that there had been no injury to the internal ear which could have caused vertigo. Such an injury would necessarily produce total deafness in the affected ear.

I submitted this case to Dr. Thor Rothstein for a neurologic examination, and append here his findings. Dr. Rothstein concurred in the conclusions I had reached, namely, that the man was suffering from a functional neurosis.

*Dr. Rothstein's Report.*—"His pupils react to light and accommodation; are equal. Eye-grounds normal.

"No paralysis in face, tongue, or extremities.

"Tendon reflexes in arms equal on both sides and lively. Patella reflexes lively; equal on both sides. Achilles' tendon reflexes also lively and equal. No Babinski reflex. No Gordon reflexes. No Oppenheim reflexes. Cremasteric reflexes equal and lively. Abdominal reflexes lively. Planter reflexes present, but rather sluggish.

"Sensation to pain is decreased on right leg, right half of tongue, and right arm, while it is normal in corresponding regions on the left side. On neck pain sense is decreased on both sides, but more so on right than left side. Pain sense is also decreased on the right half of the face, with the exception of the frontal region and all around the scar, where there exists cysts and hyperalgesia.

"There is no tremor.

"No ataxia in the hands or legs.

"He answers slowly to questions."



**CASE III.—VERTIGO CAUSED BY INTRACRANIAL DISEASE  
PRESENTING THE MÉNIÈRE SYMPTOM-COMPLEX**

Mr. H., age thirty, occupation school-teacher, consulted me in May, 1918, complaining of dizziness, head noises, and defective hearing. His trouble developed about two years ago. During this time the tinnitus, restricted to the left ear, has been continuous, but shows a decided increase during the periods when the vertigo is present. The hearing defect is noticed only in the left ear. The annoyance from vertigo is his chief complaint. This is true for almost all the cases presenting the Ménière symptom-complex. The vertigo comes only in distinct attacks. In the intervals between the attacks he is practically free from any sensation of vertigo. When the onset of the attack has been rapid he has been thrown to the ground. He has often been kept in bed for two or more days because of the vertigo. Nausea and vomiting has been frequent. He states that during the past six months he has been able to work but about half of the time because of these attacks. The patient has had no trouble from headache.

In making an examination I found nothing abnormal about the nose or throat. The drum membranes were quite normal except for a slight cloudiness.

The functional examination of the hearing disclosed no defect whatever in the right ear. In the left ear the whispered voice for both low- and high-pitched numbers (82 and 66) was heard at only 2 feet. The lower tone limit was somewhat elevated, as was shown by testing with the C fork, which vibrates but 64 times per second. The upper tone limit, tested with the Galton whistle, was normal. The  $c^4$  fork, vibrating 2048 times per second, was also normal. The duration for bone conduction was distinctly shortened. The forks, when placed on the median line of the head, were lateralized to the normal ear. The Rinne reaction was positive.

In analyzing these findings it seems quite clear that the defect in hearing cannot be the result of any obstructive process developing in the middle ear. Here is a marked defect in hearing which has developed in a man thirty years of age, in the space

of two years, which is associated with a persistent tinnitus. The process has not been associated with any distinct evidence of tubal catarrh aside from a slight cloudiness of the membrana tympani, which, however, is present in both ears and has, in all probability, nothing to do with the trouble causing the defect in the left ear. Considering the age of the patient and the manner of onset, the only process which could produce this defect in hearing because of obstruction in the sound-conducting mechanism is fixation of the stapes. The case, however, is certainly not one of fixation of the stapes, because in this disease the prolongation of bone conduction, together with a negative Rinné, are present even before the defect becomes anywhere nearly as marked as in this case. The elevation of the lower tone limit is also much more marked for the degree of deafness than is found in this case. It seems quite clear thus far that the defect in hearing in this case is not due to an obstruction in the conducting mechanism.

The defect must then be due to some disturbance of the sound-perceiving apparatus. The fact that vertigo has been a conspicuous symptom also indicates clearly an involvement of the internal ear mechanism. The most conspicuous finding in the defect in hearing caused by a degenerative process developing in the labyrinth is a defect at the upper part of the tone scale, as shown in examining with the Galton whistle. This was conspicuously absent in this case, although the other reactions, especially the shortened bone conduction and the positive Rinné, show that the case is one of nerve deafness, as opposed to middle-ear deafness.

Nerve deafness which is not caused by a degenerative process in the labyrinth must be due to some intracranial disease, and the conclusion reached by an analysis of the examination of the hearing tests points to an intracranial cause for the trouble in this case.

Let us now make an examination of the vestibular mechanism in order to determine whether the disturbance in equilibrium, the vertigo, is caused by disease in the labyrinth or by some intracranial disease interfering with the normal function of the

vestibular mechanism. I think we are safe in asserting that vertigo when present is always due to some disturbance of the vestibular apparatus, either because of disease in the labyrinth interfering with the function of the semicircular canals, or because of some intracranial disease interfering with the central pathways of the vestibular nerve. The examination of the function of the vestibular mechanism is made by stimulation of the semicircular canals and noting the effect, especially on the production of nystagmus and the effect on certain pointing tests. Alteration in the nystagmus may be due to depression of function caused either by disease in the labyrinth or by intracranial disease interfering with the vestibular nerve. On the other hand, abnormal responses in the pointing tests are usually caused by an intracranial disease which interferes with the transmission of impulses from the end-organs in the semicircular canals.

In this case the most conspicuous result of the vestibular examination was abnormal pointing tests. When a person with a normal vestibular mechanism is rotated to the right the pointing tests show a deviation to the right, and when he is rotated to the left there will be a past-pointing to the left. In this case, after rotation to the right, the right hand did not past-point at all, whereas the left hand past-pointed to the left instead of to the right, as in a normal case. After rotation to the left this patient's hands both failed to past-point.

The result of the examination of the vestibular mechanism in this case suggests an intracranial cause for the symptom of vertigo, just as the analysis of the hearing tests suggest an intracranial disease as the cause of the defect in hearing. The diagnosis is some lesion developing in the cerebellar pontine angle, interfering with the function of the eighth nerve.

#### CASE IV.—SQUAMOUS-CELL CARCINOMA OF THE LARYNX

The patient, a man aged sixty-five, consulted me in April, 1918, because of hoarse voice which came on insidiously about two years before. At the end of one year the hoarseness, he states, was as bad as when he consulted me, but after that he thought there was a distinct improvement for some time. He



has had no cough and has suffered no discomfort in the region of the throat. In the two years he has lost, however, 24 pounds in weight. This loss in weight could have been accounted for because of an abdominal condition which was operated at the Presbyterian Hospital two months before the patient consulted me. The abdominal condition proved to be carcinoma of the large intestine. A resection of a large part of the colon was undertaken by Dr. Bevan.

Examination of the patient disclosed nothing abnormal in the nasal or postnasal passages. The epiglottis was free. The movement of the vocal cords was not interfered with. The false



Fig. 51.—Squamous-celled carcinoma of the larynx.

cords were not involved nor was there any alteration in the posterior wall of the larynx. Both vocal cords were rounded, thickened, with a rough surface covered with a yellowish mucopurulent secretion. At the anterior commissure was a tumor formation, which could be seen below the vocal cords and which projected above, about  $\frac{1}{4}$  inch in diameter (Fig. 51).

The long duration of the trouble, the absence of fixation of the vocal cords, and of pain present a clinical picture of a chronic form of laryngeal tuberculosis rather than of a malignant growth in the larynx. We found no evidences of infiltration of the cervical lymphatics.

Under local anesthesia the growth from the anterior commissure was taken off and dropped immediately into Zenker's solution, and turned over to Prof. Le Count for histologic examination. Prof. Le Count reports squamous-cell carcinoma. Under a local anesthesia, infiltration with novocain, Dr. Bevan split the larynx and with a galvanocautery destroyed the thickened tissue in the larynx May 7, 1918.

#### CASE V.—LARYNGEAL PAPILLOMA

The patient is a man sixty years of age, who consulted me October 1, 1918.

His chief complaint is the loss of the speaking voice, a condition which developed gradually, beginning last January. His voice is exceedingly rough and lacks entirely any musical qualities. The character of the voice is quite different from that which one notices in a case of paralysis of the vocal cords. The hoarseness is of a type which one only hears in connection with an ulceration or infiltration in the larynx itself. The patient has at no time suffered from sore throat and at no time has there been any pain connected with his trouble, not even pain on swallowing.

He states that the hoarseness began to develop after an attack of acute articular rheumatism. He has more or less desire to clear his larynx, but has never been especially annoyed with coughing attacks. The patient is in good health. He feels no depression because of his throat trouble, although he is somewhat anxious, fearing that it may be due to a malignant growth.

In examining the patient we find no infiltration of the cervical lymphatics. A very satisfactory view of the larynx is obtained by employing the laryngoscopic mirror. The first thing that one notices is that there is no fixation of the vocal cords. On phonation the two arytenoid cartilages approximate each other, and on inspiration the cords are thrown apart, allowing one to look into the trachea. The second thing that one notices is a diffuse congestion, which involves all of the mucous membranes lining the larynx. There is a distinct diffuse infiltration of the laryngeal mucous membranes. From the right

side protrudes a new growth, which overhangs the right vocal cord. On inspiration this is thrown somewhat into the glottis, that is, into the opening between the cords. On phonation it lies above the approximated cords. The movement of the growth shows at once that it has a more or less pedicled base. The growth itself has a grayish color which is readily distinguished from the more congested appearance of the mucous membrane of the larynx. Its surface is not smooth; it has a distinct cauliflower appearance. The diffuse congestion and infiltration of the membranes of the larynx is such that one gets no glimpse of a normal vocal cord either on the right or on the left side. The right cord has lost entirely its white appearance and presents a red, rounded surface, not unlike the false cord.

The condition was clearly one of a chronic diffuse laryngitis, of which the patient has undoubtedly been a victim for many years. Superimposed on this condition has been the development of the neoplasm, which took place since last January. No doubt was left after an examination regarding the nature of the new growth. It was clearly a benign affair. This was evidenced from various reasons. In the first place, a malignant growth, long before it attains this size, would have caused a fixation of the cord on the affected side. It is one of the characteristics of a cancer developing in the larynx that the movement of the vocal cord on the affected side is interfered with very early, and the patient exhibits a degree of hoarseness which is out of all proportion to the changes due to the apparent size of the new growth. In the second place, this patient has had no discomfort in the nature of pain or sore throat. In a cancer the pain is often a very conspicuous and early symptom. This pain is frequently present before there is any superficial ulceration, but it becomes much more marked, of course, when the cancer begins to ulcerate. The pain is increased during the act of swallowing and there is often a radiation of pain up toward the ear. This radiation of the pain in a malignant growth in the larynx is caused in the same way as the otalgia associated with a peritonsillar abscess, or which is so frequently seen after a tonsillectomy. Another finding which is characteristic of a



benign growth is the more or less pedicled character of the tumor. In a malignant growth the infiltration has a diffuse base which fuses imperceptibly into the surrounding tissue and without any distinct line of demarcation.

Sometimes in a tuberculous lesion of the larynx one finds a cauliflower-like protuberance. This is especially true when the trouble develops on the interarytenoid space on the posterior wall of the larynx. A tubercular lesion involving the lateral wall of the larynx has a broad infiltrated base and is not pedicled.

One sees not infrequently a form of chronic laryngitis where there is a diffuse congestion and infiltration of the vocal cords with a rather circumscribed thickening just in front of the arytenoid cartilage involving one or both vocal cords. This condition is very readily aggravated by any acute cold. At such times the hoarseness is greatly increased. This is entirely a benign affair and is technically known as "pachydermia of the larynx." When an ulcer is present one may question at first whether the condition may not be one of tuberculosis or even of cancer. The fact that there is no fixation of the cords speaks in favor of a benign condition.

The condition present in this case is one of papilloma and is a very common form of laryngeal new growth. It is seen more often in children than in adults, where it is very often a diffuse growth which it is difficult for one to remove in its entirety. There is a great tendency for the papilloma to re-form, necessitating operations year after year. The condition is one which may clear up spontaneously.

The removal of such a growth may be accomplished in several ways, employing either the direct or the indirect method of approach. By the direct method we mean the use of instrumentation which will permit of a direct inspection of the larynx and the introduction of instruments into the larynx for the removal of the growth, without the use of reflecting mirrors. By the indirect method we mean the introduction of instruments into the larynx by means of the image-reflecting mirror. The direct method has come more into vogue in recent years, since the introduction of the suspension laryngoscopy. This requires a

general anesthesia and is frequently not an easy procedure to carry out. The indirect method is usually a much more simple procedure and is accomplished under local anesthesia. The direct method has a more general application, and can be employed in the more difficult cases where the indirect method is unusually difficult.

In this particular case the problem was one of introducing an instrument into the larynx which would remove the growth in its entirety. It seemed that a snare would accomplish this more readily than any laryngeal forceps. The latter would mean taking the growth out in pieces, and the bleeding under these circumstances would interfere very much with an effort to complete the removal of the growth at one sitting. It seemed that if a snare could be passed around the apparently somewhat pedicled growth it might be possible to remove the entire papilloma at once. There was one difficulty in this procedure that presented itself: this was the possibility of the rather large growth dropping into the trachea and causing an obstruction of the bronchus. This would not take place when using laryngeal forceps, but it seemed a possible complication when using a snare. In order to guard against this accident we had planned to have the patient take a deep inspiration after the snare had once engaged the growth, and then, while the patient was making an effort to cough, we would cause the snare to cut off the growth. The first time we tried to carry out the operation we did not succeed in getting the wire loop over the growth. After trying this for a short period we decided to let the patient rest up rather than pursue the manipulation, which was bound to result in more or less irritation of the mucous membrane of the larynx. The patient was directed to return the next morning, when the cocaineizing of the larynx was again carried out, and we succeeded in placing the snare over the growth. It seemed possible that the tumor would adhere to the wire loop of the snare and be withdrawn with it, but in order not to take the risk described above of allowing it to drop into the trachea, the patient was directed to take a deep inspiration, and during the act of coughing the growth was snared off (Fig. 52) and the instrument with-

drawn. The tumor did not adhere to the instrument, but was spit out of the mouth immediately afterward. Apparently the act of coughing had assisted in preventing the growth from dropping into the trachea.

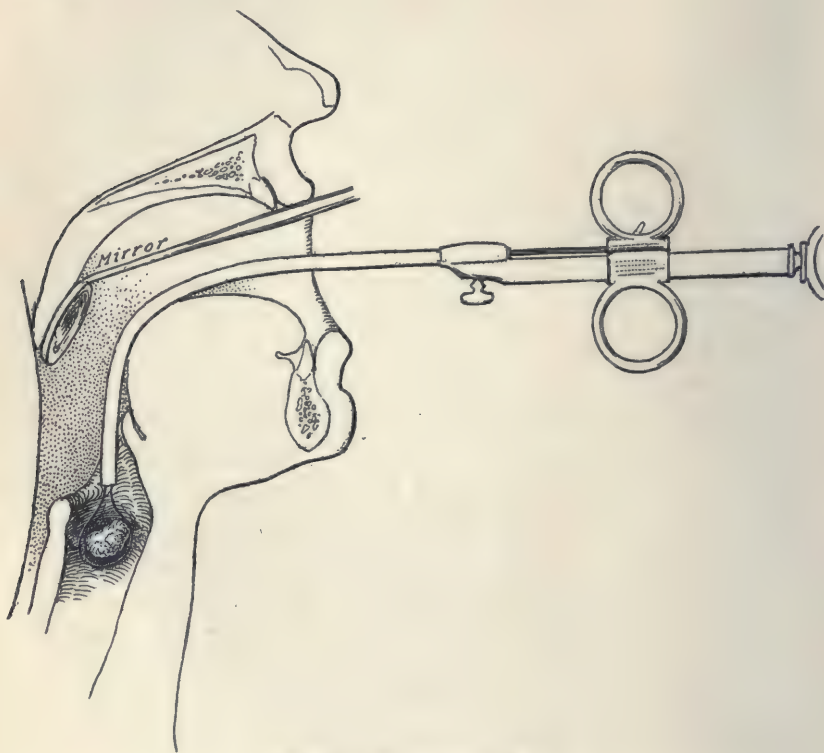


Fig. 52.—Growth snared off.

In this case we do not expect the patient to develop the normal voice, although there will probably be a very marked improvement. The diffuse infiltration of the larynx which was present before the papilloma developed there is a condition which he has had for a great many years and will probably persist.



## CLINIC OF DR. EDWARD H. OCHSNER

### AUGUSTANA HOSPITAL

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#### THREE CASES OF SINUS DISEASE

*Summary:* Case I.—Patient giving a history of long-standing nasal catarrh; repeated operations on nose and antrum of no avail; severe attack three months ago followed by a generalized arthritis; present condition; operative treatment—technic; after-history.

Case II.—Antrum infection caused by a diseased upper molar tooth and followed by an acute frontal sinus infection; operation—unusual abnormality found—frontal sinus opening into antrum instead of into nose.

Case III.—An acute frontal sinus infection following influenza—treatment—after-history.

WE have for operation this morning three very interesting sinus cases.

CASE I.—The first patient is a male, aged thirty-six. His mother died at the age of thirty-five from chronic catarrh complicated by heart trouble. His past history is negative with the exception of a chronic catarrh which has been present as long as he can remember. He describes this catarrh as a weeping of the nose rather than a stopping up of the nostrils. For years the nose has been very sensitive. Fifteen years ago the condition was so severe that it resembled hay-fever, causing him to blow his nose very frequently during the day for one year. At that time he consulted a specialist, who operated several times, removing growths from both nostrils. The patient thinks the doctor called these growths polypi. At the same time the doctor penetrated the nose into the antrum, drawing out more than a thimbleful of pus. Following these operations the patient moved from Buffalo, N. Y., to Washington, D. C., and in the warmer climate the catarrh seemed to improve, but he still continued to suffer from severe "head" colds. His nose would run profusely for one or two days and then for many days afterward he would blow or spit out a great deal of yellowish-green matter.

About two years ago the colds became more severe, and he again consulted a rhinologist, who irrigated the nostrils two or three times a week for many weeks, with only temporary relief. Three months ago he had a more severe cold than usual, with grippy symptoms. This was diagnosed by one physician as catarrhal jaundice. A few weeks after getting out of bed his heels became sore, the soreness gradually spreading to feet, ankles, and knees. He had slight pyrexia at the onset. One week later the pain became so severe that he could scarcely walk. He then consulted an internist, who thought the arthritis was from the teeth. Two teeth were extracted without relief of symptoms. He was then referred to a rhinologist, who opened the antrum through the nose, put the patient to bed, and gave 40 grains of aspirin daily. While taking the aspirin the pains improved, but as soon as it was discontinued, they returned.

The patient came under my care three days ago with practically every joint in the body involved—swollen, painful, and with marked limitation of motion. Temperature was 103° F. and pulse ranged as high as 140. He gave a history of passing some pus from the right nostril and hawking considerable from the pharynx.

Blood examination showed 16,500 leukocytes; 2,700,000 erythrocytes, and 90 per cent. hemoglobin. Differential white count gave 84 per cent. neutrophils, 9 per cent. small lymphocytes, 6 per cent. large lymphocytes, and 1 per cent. eosinophils.

On transillumination there was a shadow over the right antrum. The other sinuses were clear. The heart was slightly enlarged, with a systolic murmur over the apex.

It seems evident from this history and these findings that this patient is still suffering from an infection of the right antrum which has resulted in a panarthritis and septic endocarditis, and it is further evident that the operations and treatments by way of the nose have been unable to cure the process, in spite of the fact that they were performed by a number of our most prominent rhinologists. We have, consequently, advised a more radical operation, and will now proceed to do it.

We make an incision through the mucosa and periosteum in

the canine fossa of the right superior maxilla, reflect the periosteum with a periosteal elevator, and then with this  $\frac{1}{2}$ -inch carpenter's gouge make a circular opening  $\frac{1}{2}$  inch in diameter into the antrum. No free pus appears, but on careful examination we find the antrum lined with a velvety grayish-yellow membrane, which is firmly adherent to the bone. We scrape this away with a sharp curet and rub it off with a piece of gauze placed over the end of the curet. We now break down the inner



Fig. 53.—Method of draining maxillary and frontal sinus.

wall of the antrum, insert a ligature carrier, and draw through a Number 12 soft-rubber catheter, letting one end project through the nose and bringing the other end out through the opening in the antrum, and then sewing the ends together with a braided silk stitch, as illustrated in Fig. 53.

We now pack the antrum with iodoform gauze which has been soaked in Churchill's tincture of iodine, being careful to pack it just tight enough to make pressure and encourage healthy granulations to take the place of the pyogenic membrane, and yet not



tight enough to cause pain. We will leave this packing in place from three to six days, depending upon the tolerance of the patient to the pressure. At the end of this time we will remove it and begin irrigating the nose with nascent chlorin solutions.

This is one of the few instances in which I still use irrigation. I practically discontinued irrigations of all kinds twenty-four years ago, as the result of a rather interesting experience which I had at that time.

I was resident surgeon at the Cook County Hospital, and in one of the changes of service there came under my care a little seven-year-old lad who some three years previous had had an empyema of the pleura. In the intervening three years he had had innumerable operations and practically daily irrigations. It occurred to me that having had so much irrigation, a change might be desirable. I consequently stopped irrigating, and within two weeks he was entirely healed. Since that time I have never irrigated an empyema of the pleura and never had a primary case of empyema of the pleura need a secondary operation, and have practically stopped all irrigations where the tissues can fall together, and have found this practice to greatly favor healing. The only exception I make is in empyema located in an incollapsible cavity, such as empyema of the antrum or the frontal sinus. In these instances I have found irrigations of value.

In this case we select a chlorin solution because, both from the appearance of the pyogenic membrane and the history of the patient, I am fully convinced that the major infective agent in this case is the *Bacillus mucosus*, which we know is a semi-saprophytic organism, and it has been rather fully demonstrated that the nascent chlorin solutions can be looked upon as more or less specific in all saprophytic and semisaprophytic infections.

*Note.*—The patient made a slow but gradual recovery. Pyrexia disappeared in the course of about three weeks, tachycardia in six weeks, discharge from nose and antrum in ten weeks, and the antrum closed in eleven weeks. On his discharge from the hospital eleven weeks after operation the joint symptoms had almost entirely disappeared, as had also the mitral murmur.

CASE II.—The second patient this morning is a man, aged twenty-nine, a shoe salesman, living in Mississippi, with negative family and previous histories.

Seventeen months ago he began to have trouble with the first left upper molar. A cavity developed from which pus discharged into the mouth from time to time. Eleven months ago an alveolar abscess developed on this tooth, and shortly after severe pain developed over the left antrum, and considerable mucopurulent material began dropping into the pharynx. At this time the tooth was extracted, but the trouble did not clear up. Nine months ago he had the antrum treated through a trephine opening in the root space of the extracted first left upper molar tooth. The treatment failed to relieve either the discharge of pus from the pharynx or the pain in the antrum. Two months later the antrum was opened through the left nostril, following which the pain became somewhat better, but never entirely disappeared. Two weeks ago he had severe pain and a feeling of pressure over the left frontal sinus, accompanied by some pyrexia.

Physical examination was negative except for tenderness over the left frontal sinus, an unusually high palatal arch, and some pus in the left pharynx. The left antrum and left frontal sinus were darker than the right on transillumination. Vacuum cup applied in both nostrils after cocainization brought no pus.

**Operation.**—In this case we will make an incision over the left frontal sinus, cutting directly through the area of the eyebrow. We will extend the incision from its inner angle to a little more than halfway to the outer end of the eyebrow, cutting through the skin and periosteum. The periosteum is now reflected and the frontal sinus opened with a  $\frac{1}{2}$ -inch gouge. Immediately on opening the frontal sinus a thick creamy pus wells out with considerable pressure. We remove the pus by packing in strips of gauze. When the pus is removed we pack the cavity tight with a piece of gauze saturated with tincture of iodine. We are careful to treat the edges of the cut bone with the iodine in order to close the openings which are normally found in the diploë. The purpose of this is to prevent the infection from

spreading along the *diplöe*. I have seen a number of cases in which this precaution was not taken develop periosteal abscesses at a considerable distance from the frontal sinus operation. In fact, I recall one case that developed numerous periosteal abscesses.

We now take an eye probe, bend it slightly, and pass it through the infundibulum into the nose. We now introduce the little finger into the left nostril as a guide in order to locate the lower end of the probe so that we may grasp it with an artery forceps. We are unable to find the lower end of the probe in spite of the fact that it has been pushed through the infundibulum as far as it would go and should rest on the floor of the nose. It is evident that we have here a very unusual abnormality, a frontal sinus opening into the antrum instead of into the nose. This may explain why the violent frontal sinus infection followed the antrum infection, and also why the vacuum cup brought no pus.

In recent years I have been operating less and less frequently on frontal sinus infections. The great majority of cases I have been able to relieve permanently by cocainizing the nasal mucous membrane and applying the vacuum cup about twice a week. This usually draws out the pus from the frontal sinus and results in a cure, as shown by the disappearance of the pyrexia and pain, of the pus from the fauces and the nose, and of the shadow on transillumination.

We will now incise the mucosa over the canine fossa of the left maxilla, and after reflecting the periosteum, open the antrum with the same gouge, making the opening fully  $\frac{1}{2}$  inch in diameter. We now insert the little finger into this opening, and here in the antrum we find the lower end of the probe, which passes from the frontal sinus through the infundibulum into the antrum, as shown in Fig. 54.

Into the eye of the eye-probe we thread this strong braided silk (Fig. 55) which has a number of knots of various sizes, and we draw it back and forth until the infundibular opening will freely admit the passage of a No. 12 French catheter. We now break down the bony septum between the antrum and the nose



and draw through a No. 16 rubber catheter, passing out through the left nostril and through the outer opening of the antrum, and then suture these two ends together, as illustrated in Fig. 56. We insert a small rubber drainage-tube into the frontal sinus,

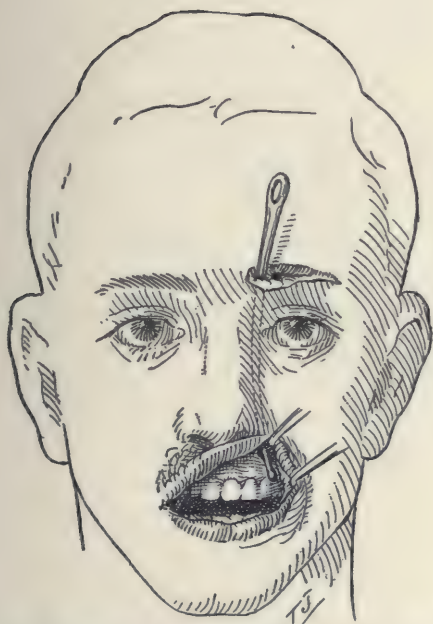


Fig. 54.—Illustrating abnormality. Probe passing through infundibulum into antrum.



Fig. 55.—Knotted silk for enlarging the infundibulum.

as also illustrated in Fig. 56, and then pack both the antrum and the frontal sinus with gauze saturated with tincture of iodine and close both angles of the supra-orbital wound. We apply a wet dressing of saturated boric acid in water over the supra-orbital wound because this pus looks like staphylococcus pus, and we

have demonstrated repeatedly that saturated solution of boric acid is a true specific for this infection. In this case we do not add alcohol to our solution, nor do we use a protective, as either of these might cause serious damage to the eye. The packing will be left in two or three days. After removal the wounds will be irrigated daily with boric acid solution until the infection has entirely cleared up.

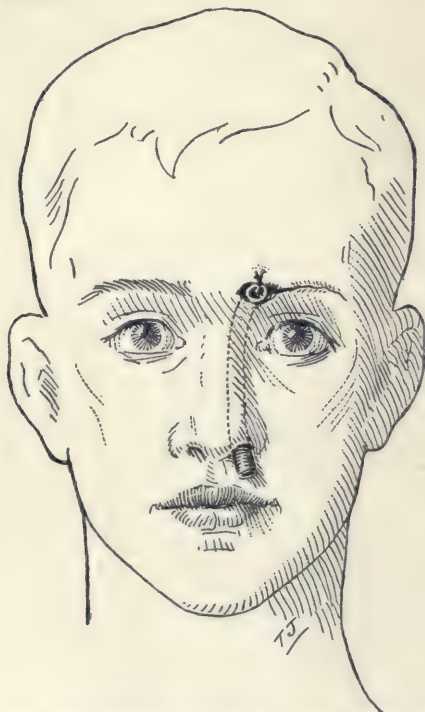


Fig. 56.—Illustrates method of draining frontal sinus.

CASE III.—The third case is an acute one. The patient, a boy of sixteen, was taken ill nineteen days ago with a severe attack of influenza. After seven days the temperature became normal. Five days ago he had a sudden severe pain over the left temple, extending into the eye and upward into the forehead, with a recurrence of his pyrexia, which has been around 102° F. until the present time.

On examination, we find a rather anemic boy, with severe

pain and marked tenderness over the left frontal sinus and a drooping of the left eyelid. There is complete dulness over the left frontal sinus on transillumination.

After shaving, which has been delayed because of severe tenderness of the part, we make an incision through the area of the upper eyebrow, beginning at the inner end and extending a little beyond the median line, reflecting the skin and periosteum and opening the frontal sinus with this  $\frac{1}{2}$ -inch gouge. Immediately a thick creamy pus is released under high pressure. We will sponge out this pus and pack the cavity and cut surfaces of the bone with gauze soaked in Churchill's tincture of iodine.

On careful exploration we find that the abscess has ruptured into the right frontal sinus and also through the orbital plate of the frontal bone into the retro-orbital space. We now pass an eye-probe through the infundibulum into the nose and out through the left nostril. By means of this knotted, braided silk threaded on the eye-probe the infundibulum is enlarged until a No. 12 French soft-rubber catheter can be readily drawn through. The upper end of the catheter is fastened to the skin incision and the lower end is permitted to project through the nostril, as shown in Fig. 56. We will now pack the wound with gauze saturated with iodine. After closing the inner and outer angles of the wound wet boric acid dressings will be applied.

*Note.*—Careful microscopic examination of the pus showed it to be a mixture of *Diplococcus pneumoniae* and *Micrococcus catarrhalis*. The gauze packing was removed on the third day, the upper end of the rubber catheter cut off flush with the wound on the fourth day, and gradually withdrawn through the nostril, until completely removed on the eighth day. All discharge of pus had ceased by the twelfth day, and, with the exception of a slight superficial defect, the wound closed by the fourteenth day.





## CLINIC OF DR. EDWARD LOUIS MOORHEAD

### MERCY HOSPITAL

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#### REPORT OF FOUR CASES

*Summary:* Case I.—*Gynecomazia or gynecomastia:* A boy of eleven complaining of swelling of right breast—examination; types of gynecomazia; treatment; bibliography.

Case II.—*Intraligamentous uterine fibroid complicated by pregnancy:* Patient giving history of uterine hemorrhages beginning four and one-half months after marriage; examination; operation—findings; examination of specimen; after-history.

Case III.—*Compound fracture of the ankle-joint with forward dislocation of the foot:* Patient admitted to hospital with injury to left foot; immediate treatment of fractures; operation—prognosis.

Case IV.—*Impacted intra-articular fracture of neck of femur:* Patient giving a history of having fractured her femur one year ago—treatment at that time—results; present condition—removal of screws; treatment of impacted intra-articular fractures of the neck of the femur; prognosis in present case.

#### CASE I.—GYNECOMAZIA OR GYNECOMASTIA

AMONG the rarer anomalies of the breast occurring in the male is the condition known as gynecomazia or gynecomastia. According to the accepted definition, it is the development upon a male of mammæ resembling those of a female, either with or without the secretion of milk.

Our patient, a schoolboy, eleven years of age, born in the United States and of Italian descent, enters the hospital for relief of the complaint—swelling of the right breast. The child does not know the exact duration of his present trouble, but thinks that it is of some months' standing. It began as a slight enlargement of the right breast, which has gradually increased in size. It has never been painful and is tender only on firm pressure. There is no history of injury, inflammation, or discharge from the nipple. The axillary lymph-glands on the right side have shown no enlargement or tenderness.

The past history is negative except for the usual diseases of childhood. Mentally the boy appears normal and is in the fifth grade at school. The family history is negative. Two other boys, older than this one, have been born to these parents and do not show the anomaly.

Upon physical examination, the patient is seen to be a fairly well-nourished boy, apparently about the age stated, and not acutely ill. General examination is negative except for the following condition: There is a marked enlargement of the right breast. This is painless and non-inflammatory. As you see, the breast appears about as large as that of a girl eighteen years of age. It is freely movable and not adherent to the underlying structures. It projects about  $5\frac{1}{2}$  cm. and the horizontal diameter is 10 cm. The nipple protrudes but slightly beyond the summit. The skin over the breast is freely movable, and the substructure is firm and lobulated and has the feel of an adult woman's breast. There are no enlarged right axillary lymph-glands. There is no corresponding enlargement of the left breast. Both testicles are present and in the scrotum. There are no anomalies of the external genitalia. There is no enlargement of the thyroid nor any evidence of hyperthyroidism. Blood count is normal, examination of urine negative, and the Wassermann test is reported negative (Fig. 57).

This condition has been long recognized. Aristotle<sup>1</sup> says he has seen men with *mammæ* which were as well developed as those of a woman, and Paulus Ægineta recognized the fact in the ancient Greeks. To Bedor, a marine surgeon,<sup>2</sup> we owe the first scientific exposition of this subject.

Distinction must be made between cases of real glandular hypertrophy and those in which there is a heaping up of fat and fibrous tissue. Probably the best classification of the condition is that given by Gruger, of Petrograd:<sup>3</sup>

1. That in which the male generative organs are normal.
2. In which they are deformed.
3. In which the anomaly is spurious, the breast being a mass of fat or a new growth.

To those cases falling into the first class we may apply



the term "essential gynecomazia." Into the second class we must put all cases of testicular atrophy, whether congenital or acquired. The latter condition may be the sequel of an orchitis due to trauma, mumps, syphilis, or tuberculosis.

Gynecomazia may be unilateral or bilateral. The condition seldom manifests itself until adolescent or even adult life. The essential type is probably prenatal in origin and shows a tendency to occur in members of the same family. Cases are on record of the occurrence of the condition in both father and son.



Fig. 57.—Gynecomastia, right side, boy eleven years old. Two views.

Secretion of milk may or may not occur. The breast usually reaches a definite size and then growth ceases. The condition has been known to disappear spontaneously.

No treatment is necessary unless the condition gives rise to deformity or becomes troublesome. In this boy it will occasion some embarrassment when he goes in swimming or engages in athletics. It has been known to become troublesome during exercises on parallel bars. In mild cases a compression bandage with the internal administration of potassium iodid

is indicated; in the acquired forms organotherapy has been suggested; in the syphilitic the treatment is that of syphilis. We shall treat this boy expectantly, using the compression bandage and small doses of potassium iodid. From time to time we shall have him return to the hospital for observation.

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### CASE II.—INTRALIGAMENTOUS UTERINE FIBROID COMPLICATED BY PREGNANCY

This patient, Mrs. Q., was referred to me with a history of having had excessive hemorrhages from the uterus for the past six weeks, which her physician has tried in vain to stop. She is forty-two years of age and has always enjoyed good health up to this time. She is the mother of two children by a former marriage, one sixteen years and the other twelve years of age. Her menstrual functions have always been regular and she has suffered no special discomfort at those times.

After being a widow for eight years, she remarried six months ago. Nothing unusual occurred until six weeks ago, when she began having uterine hemorrhages, at first slight, but gradually increasing in quantity and duration. There has been great difficulty in obtaining a bowel movement and a feeling of pressure or weight in the lower abdomen.

The patient is fairly well nourished, but rather pale from loss of blood. Heart and lungs are negative. Abdomen: Upon external examination a mass is felt in the median line, extending up almost to the umbilicus. Upon bimanual examination, this mass is found to fill the entire basin of the pelvis, extending low down in the culdesac and more to the left side. The vagina is very much narrowed by the encroachment of the mass and the cervix cannot be outlined, although high up behind the symphysis pubis the external uterine os can be determined. The mass is not movable and it is of firm consistency and hard, except in

the center of the upper anterior part, which is apparently a little softer to the touch.



Fig. 58.—Intraligamentous uterine fibroid complicated by pregnancy. Front view. The posterior wall of the uterus is part of the tumor mass, which extended between the folds of the broad ligaments more on the left side and downward into the pelvis, filling the space between the rectum and symphysis. The cervical portion of the uterus is practically obliterated. The anterior wall of the uterus has been divided, showing the fetus *in situ*. Arrows indicate point where peritoneum was divided for the enucleation of tumor.

This case presents two or three points to be considered in its diagnosis and treatment. What is the probable nature of the



growth? Is it removable? Is it complicated? Our diagnosis is an intraligamentous uterine fibroid, possibly complicated by pregnancy. As for treatment, there is but one procedure, and that is operation. The patient cannot survive unless the hemorrhages are stopped, and I am satisfied that all means outside of operation have been tried and failed.

The patient has been prepared for operation and I will now make the usual right rectus incision between the umbilicus and



Fig. 59.—Sagittal section of uterus and tumor mass, showing the involvement of the posterior wall of the uterus and cervix.

the pubes. Upon opening the abdomen and passing the left hand down upon this mass I find that it fills the pelvic outlet and extends laterally into the broad ligaments, more on the left than on the right side. The upper anterior portion is softer and is probably the anterior uterine wall. In order to remove this growth it will be necessary to split the broad ligaments of both sides on their upper surface, making an anterior and a posterior flap. In this way the growth can be enucleated and the de-

nuded surfaces covered over by suturing the edges of the divided broad ligaments. The enucleation is rather difficult, great care being taken to avoid injury to ureters, bladder, and rectum, but finally the entire mass is removed. All bleeding points are now ligated and the abdomen closed in the usual manner.

Let us now examine the specimen. The right tube and ovary are present. The left tube is present, but the ovary has

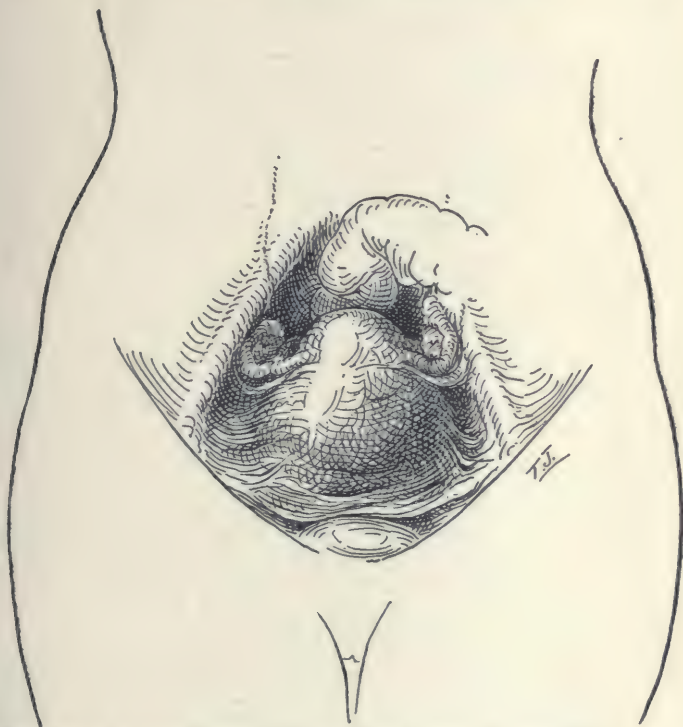


Fig. 60.—View of tumor *in situ* upon opening the abdomen previous to enucleation.

become detached during the manipulations, and we have it here separately. Upon opening the soft part on the superior anterior surface the uterine cavity is exposed, and a fetus of about nine weeks is found. You will notice that only this upper part is covered by peritoneum, the lower three-fourths of the mass being devoid of peritoneal covering, as it was enucleated from between the folds of the broad ligament. The

posterior uterine wall is part of the tumor mass. I think you will all agree that the procedure followed in this case was the correct one.

*Note.*—Patient made an uneventful recovery, leaving the hospital at the end of three weeks.

### CASE III.—COMPOUND FRACTURE OF THE ANKLE-JOINT WITH FORWARD DISLOCATION OF THE FOOT

Mr. F. S., age thirty-eight years, was admitted to Mercy Hospital yesterday afternoon with the history of having fallen from the top of a pile of wood about 12 feet high. He struck upon the ball of his left foot and was unable to arise. Upon admission to the hospital the wound was cleansed, a temporary retentive dressing applied, and the usual prophylactic antitetanic serum given.

Upon examining the skiagraphs we find that there is a fracture of the fibula about 4 inches from the lower end, with an outward displacement of the lower fragment. The internal malleolus and articular end of the tibia are fractured and the tibia is protruding through the soft parts to the side and behind the os calcis, with the foot displaced forward.

We have then to deal with a compound fracture at the ankle-joint with a forward dislocation of the foot. This is an unusual injury, and was caused, no doubt, by the extreme dorsal flexion of the foot upon the ankle, produced by the weight of the body acting as a leverage upon the ball of the foot.

The patient is now anesthetized, the temporary dressing will be removed, and the field of operation cleansed as thoroughly as possible. The soft parts are very badly lacerated. There is very little bleeding notwithstanding no constrictor has been applied. Apparently there is no circulation in the foot. While I do not think there is any prospect of saving this foot, and probably primary amputation would be the best, I shall dress it in position and watch it for a few days. There is no difficulty in reducing the dislocation, as the soft tissues on the posterior aspect of the leg have been torn through, but it will be necessary to apply a Lane plate to the tibia and astragalus in order to retain



them in position. Through-and-through drainage is established, no attempt being made to close the soft parts at this time.



Fig. 61.—Anteroposterior view of compound fracture at the ankle-joint with forward displacement of the foot. The lower end of the fibula is protruding on the outer side of the ankle, while the fractured tibia is protruding from the inner side. The muscles of the posterior aspect of the leg have been severed.

A retentive dressing, fenestrated so that the wound may be irrigated, is now applied and the patient returned to bed. He will be watched closely.

From the extent of the injury to the soft parts in this case there is another element besides sepsis which must be considered, namely, a traumatic gangrene of the parts below the site of



Fig. 62.—Lateral view of compound fracture at the ankle-joint, with forward displacement of the foot.

injury. There is no apparent active circulation in the foot now, but we shall wait and see what the outcome will be. If the foot

can be saved, all means must be exhausted to do so. The prognosis, however, is bad because of the severe injury to the blood-vessels. These cases usually result in amputation.

#### CASE IV.—IMPACTED INTRA-ARTICULAR FRACTURE OF NECK OF FEMUR

Mrs. C. gives the following history: She is sixty-two years of age, married, and the mother of six children. She has always enjoyed good health until one year ago. At that time, while engaged in doing her family washing, she slipped on a clothes stick and fell upon her left hip. There was immediate and complete loss of function. A physician was called, who made a diagnosis of a rupture of the ligaments of the hip-joint and prescribed the use of liniments. She remained at home for two weeks, and was then removed to a hospital. She states that an extension was applied to the limb for about one week, and then she was informed the bone was fractured and that it would be necessary to operate upon the hip in order to effect a cure. She gave her consent to this, and the operation was performed about three weeks from the date of receiving the injury. Two screws were inserted to hold the fragments in position. I want you to remember this point regarding the time intervening between the date of injury and operation, as I may refer to it later. After remaining in the hospital for six weeks she was removed to her home, where she remained in bed for about four months. At this time she was placed in a chair and attempts were made to use the limb. There was constant pain, more or less severe, in the hip, and after the efforts to use the limb a swelling appeared upon the outer side of the hip. This swelling has gradually increased in size and is quite painful to touch. She comes to us now, about one year following the injury, for relief from this pain and swelling, and to ascertain if she will ever be able to use the limb.

Upon examination the left limb is found to be  $2\frac{1}{2}$  inches shorter than the right one. There is eversion of the left foot. The motion at the hip-joint is limited. On the outer side of the left hip there is a distinct swelling, more prominent at its



upper part, and quite firm to the touch. By consulting the skiagraphs of the hip-joint which were made yesterday the swelling is found to be caused by two large screws, which, no doubt, were placed there at the time of the operation.

The patient having been anesthetized and the field of operation prepared, an incision is made over the most prominent



Fig. 63.—Impacted intra-articular fracture of neck of femur. View taken previous to operation.

part of the swelling, and with the aid of a forceps and screw-driver the screws, which have backed out of their original places and are loose, are now removed. There is apparently a fibrous union of the fracture and nothing further will be done at present. The wound will be closed without drainage. After a week of

rest in bed we will see how much use the patient has of the limb and determine whether any further procedure is necessary.

Examine closely the skiagraph with the screws in position and you will notice that the larger screw (which is 5 inches in length) passed not only through the greater trochanter and the head of the femur, but that it also passed through the pelvic bone. Also notice that the femur has been carried upward and



Fig. 64.—Impacted intra-articular fracture of neck of femur. View taken at time patient was admitted to my service for relief of swelling on side produced by the screws.

outward by the position in which the screws were applied, thus accounting in a measure for the great shortening of the limb. We are fortunate to have for comparison the skiagraph which was made of this hip-joint previous to operation. The patient gave it to me that I might have a better understanding of her injury.

Examine the original skiagraph and tell me what would be your diagnosis and also your line of treatment. To me the skiagraph shows an impacted intra-articular fracture of the neck

of the femur. This form of fracture rarely occurs except in old people, and the cause is always direct violence, a fall or blow upon the hip. The appearance of the limb is very characteristic. It lies on its outer side everted, and it is not possible to rotate it inward, as it is when the bone is not impacted. Shortening of from  $\frac{1}{2}$  to 1 inch occurs. Sometimes the patient can lift the limb from the bed. Crepitus and undue mobility, of course, are wanting, while the amount of pain and the severity of the shock naturally vary with the nature of the accident.

The important point in these fractures is the impaction. If this can be preserved, repair is fairly certain with the minimum of deformity. If it is broken down, in the one case there will be only ligamentous union, perhaps none at all; in the other, the deformity and the shortening will almost certainly be increased and the period of confinement much lengthened. The limb must be handled with the utmost care, and any manipulation that is not absolutely necessary strictly avoided. For the sake of security the limb should be bandaged to a long splint, or, if there is any fear of congestion of the lungs, fixed between sand-bags with a weight of 2 or 3 pounds attached, not for the purpose of keeping up extension, but merely to prevent muscular spasmodic contraction. In three or four weeks a Thomas splint may be applied, or the limb encased in a plaster cast, and the patient allowed to get about on crutches with the foot suspended in a sling.

Fractures of the neck of the femur do not, as a rule, require operation in the early stage, except in cases where the head is displaced downward and backward and the fractured ends cannot be brought into apposition by manipulation.

From a study of the original skiagraph in this case the proper course to have been followed, I believe, would have been the application of a long splint or the use of sand-bags and to have waited a reasonable time for union to take place before applying any operative measures. The position of the fractured bone is much better in the skiagraph previous to operation than in the one following operation. The patient probably will have some use of the limb, but not as much as she would have had if the impacted fracture had not been disturbed.



## CLINIC OF DR. DANIEL A. ORTH

### ST. MARY'S HOSPITAL

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#### STRANGULATED FEMORAL HERNIA OPERATED UNDER SPINAL ANESTHESIA

*Summary:* A strangulated femoral hernia in a woman of seventy-eight; operation under spinal anesthesia—advantages of this method; technic of operation; history of spinal anesthesia—various drugs used for this purpose—apparatus—employment of preliminary narcotics—method of injection—site of puncture; value of spinal anesthesia in emergency operations on patients suffering from influenza.

WE have this morning a femoral hernia in a woman seventy-eight years of age which we shall operate under spinal anesthesia. She gives the following history:

Ten years ago she noticed a swelling in her left groin which became smaller at times, but never entirely disappeared. It caused her no inconvenience until two days ago, when, after lifting her grandchild, a boy ten years of age who is sick with influenza, the swelling suddenly became larger and she felt a severe pain in that region. In addition to this pain, which she described as similar to a toothache, there were severe colicky pains in the lower abdomen, cramp-like in character. She became sick at her stomach and vomited at frequent intervals. Her bowels have moved several times, and when given a soap-suds enema a few minutes ago the nurse reported good results.

Soon after taking sick a doctor was called, who tried to reduce the swelling, but was unsuccessful. He then gave her a prescription and told her to apply hot applications until he returned the next day. The following day he tried to reduce the swelling, but the pain was so great that she begged him to put her to sleep. He said he would have to have help, and that afternoon brought another doctor, put her to sleep with ether,

and again tried to reduce same, but was unsuccessful. She was admitted to the hospital two hours ago.

**Physical Examination.**—The patient is a poorly nourished woman with an anxious facial expression and lips of a bluish, livid color.

Head, eyes, ears, nose, and throat are negative.

**Mouth.**—The tongue is coated with a grayish fur. She has only a few teeth, and there is slight pyorrhea.

**Heart.**—The apex impulse is felt in the sixth interspace. The action is irregular and the sounds are of poor quality. There are faint systolic murmurs at the apex and in the aortic area. Pulse is rapid, thready, and compressible.

**Abdomen.**—Level, with tenderness over entire abdomen. There is a tumor about the size of an orange in the femoral region and extending above Poupart's ligament. This tumor is flat on percussion, very tender, and feels like indurated masses of omentum.

**Extremities.**—Tremor of hands; knee-jerks sluggish; no edema or varicosities.

**Diagnosis.**—Strangulated femoral hernia.

From the physical findings of the mass we can conclude that this is a strangulation of the omentum alone, whereas if it were intestine this mass would be rounded, smooth, tense, and elastic. Although these patients vomit, the bowels continue to move, but we do not generally have the condition of shock present in this case. It is possible that besides the omentum we may have a strangulated bowel, and that the tympanitic note usually obtainable upon percussion is obscured by the omentum, or the bowel may have been empty and contained no gas at the time of strangulation. I think in this case the shock can be accounted for from the history of the manipulations which were repeated under ether anesthesia.

We shall operate on this patient under spinal anesthesia. It is just in these cases where spinal anesthesia is most needed that it is best borne. Thus, it is borne better by old or weak persons than by strong, robust individuals, who can better stand ether anesthesia. The reason for this, it is thought, is

that the solution is not so quickly absorbed and, therefore, lies longer in the spinal canal than in younger persons.

We have used spinal anesthesia in over 700 cases during the last four years, and have used it no doubt where others have been successful with local anesthesia, viz.: hernias; but we prefer this method for the following reasons:

1. The operating time is a great deal shorter than with local, thereby lessening the danger of sepsis from exposure of the wound.

2. There is no pain when traction is made on the parietal peritoneum, either by pulling on the sac or on the mesentery in cases where resection of the bowel is necessary in strangulated hernia; relaxation is perfect, again shortening the operating time.

3. It causes a complete nerve block by blocking the transmission of impulses from the brain, preventing surgical shock.

4. Spinal anesthesia with apothecin or novocain, when properly given, is as safe as a local anesthesia with the same drugs.

There are a great many not in favor of its use, chiefly those who have had very little personal experience with the method, and who still find it difficult to eradicate from their minds the profound impression of danger produced by the early mortality when cocain was used. Dr. Freeman Allen says he remembers when he considered spinal anesthesia an absurdly dangerous method; now he considers it a remarkably safe one.

In the patient about to be operated we have omitted the preliminary narcotic on account of her age—seventy-eight—and her extremely feeble condition. The sister has just called my attention to the fact that the patient has a very weak pulse and that her skin is cold and clammy.

The back has been aseptitized and the field for the lumbar puncture draped with sterile towels. Our landmarks are identified by this lower towel, and we palpate for the first available space above, which is between the spinous processes of the third and fourth lumbar vertebræ. To aid us an assistant holds the patient's legs and head in such a way that the back is bent to



make the vertebræ prominent and increase the space between these lumbar spinal processes. We introduce our needle about  $\frac{1}{2}$  inch outside the middle line, and not in the middle on account of the resistance offered by the strong median ligaments; furthermore, we avoid the extradural plexus of veins which lie in the median line. With my left hand I place the ball of my thumb against the lower border of the vertebra above, locate the point of puncture with the tip of the thumb, and with my right hand insert the needle inward and forward until the resistance of the ligamentum subflavum is felt; when this resistance is overcome we withdraw our stylet. The point of the needle is now in loose extradural tissue and we push same forward a little at a time until we pass through the dura, and now you see the escape of the cerebrospinal fluid. It escapes in rapid drops, which is essential for a successful anesthesia. No blood beyond 2 or 3 initial drops should come away through the needle before the appearance of the spinal fluid. When you get only blood, and this does not promptly give way to spinal fluid, you are probably in the extradural plexus of veins, in which case you withdraw your needle entirely and re-enter at some other available space, otherwise you will inject into the plexus. We have withdrawn 3 c.c. of spinal fluid, which equals the amount of solution to be injected; this is put aside. We now withdraw another 4 c.c. and add this to our solution in this sterile beaker, draw the whole amount, 7 c.c., into our syringe, and inject very slowly. After the injection the needle is withdrawn with a quick jerk and the puncture sealed with cotton and collodion. As soon as this is done we place the patient on her back and asepticize the field of operation. By the time this is done we generally have anesthesia in the perineum, thighs, and legs, which is the case here; you see she makes no sound when I pinch her with these towel-clips. From the thighs to the umbilicus we have to wait from five to ten minutes before the skin, muscle, and fascia is anesthetized when apothecin is used, but when novocain is injected the anesthesia generally sets in and proceeds more rapidly. She makes no objection when we place these clips on the lower towels through the skin, but does higher up. Now,

after seven minutes from the time our field was prepared, we are ready to operate.

We make our incision over the center of the tumor parallel to Poupart's ligament so as to give access to the inguinal canal if such a step is required. We cut through the skin and superficial fascia and find the sac embedded in a firm layer of fat. We free the sac from its surroundings by blunt dissection, open it, and find that it contains only omentum which is quite adherent to the sac and inflamed. In loosening the adhesions the omentum was badly damaged, which will necessitate its removal. We are obliged to cut the ring to liberate it; it is pulled down and we place our ligatures above the portion which was contained in the sac, cut the omentum beyond the ligatures, leaving enough to prevent slipping. We further separate the sac from its surroundings by blunt dissection with gauze, pull same down out of the canal as far as possible without tearing it loose, transfix the sac with catgut, and remove that portion beyond the ligature, again leaving enough tissue outside of the ligature to prevent slipping. This allows the stump to disappear into the peritoneal cavity. The ring is repaired with a few catgut stitches to restore it as nearly as possible to its original condition and then close the external wound, after removing these pieces of fat in the cavity formed by the removal of the sac with a piece of moist gauze. We do not tamper with the ring any further than this. Professor A. J. Ochsner, our Surgeon-in-Chief, has shown that this is sufficient, because it is based on the principle that it is practically impossible to keep a circular opening in any part of the body from closing spontaneously unless it be lined with a mucous or serous membrane, and that when once deprived of its serous lining by removal of the hernial sac, this ring contracts and closes very rapidly. This completes the operation. The only sound the patient emitted during the operation was when the sister injected 1 grain of caffein citrate into her arm.

I would like to take this opportunity to say a few words regarding spinal anesthesia. Spinal anesthesia had its beginning with the experiments of Dr. J. Leonard Corning, which were

published in the New York Medical Journal, October 31, 1885. He made several successful experiments with cocain, but his method did not meet with favor, and was accordingly dropped, until taken up some years later by Bier. He also used cocain, practising on himself, his assistant, and 6 patients. In all the cases anesthesia was produced in the legs and with the larger doses up to the navel. In his article in the *Deutsch. Zeitschr. f. Chir.*, 1899, in which he reported the above cases, he urges great care in the use of the method on account of the dangerous effect of the drug, stating, however, that the time would come with the development of chemistry when a drug applicable to spinal anesthesia would be found. In 1905, at the German Surgical Congress, Bier called attention to the use of stovain, discovered by Fourneau in 1904, which, together with the addition of one of the suprarenal preparations, lessened the dangers attending its use. He expressed the opinion that spinal anesthesia, though not yet perfected, could be recommended for clinical use. The lumbar puncture of Quincke (1891) was of great importance for further progress; it having been established as a diagnostic and therapeutic method, the further steps toward spinal anesthesia were easier. Today it is used in France, Italy, Germany, and by many of our surgeons in operations below the costal arch where a general anesthesia is contra-indicated. Dr. Kellogg Speed only recently reported nearly a hundred amputations of the lower extremities in war surgery in which he used stovain. He reports that each and every one was perfectly anesthetized and that the anesthetic was very satisfactory. Professor Bastianelli, of Rome, whom I recently had the pleasure of meeting at Professor A. J. Ochsner's clinic at the Augustana Hospital, used novocain for spinal anesthesia until the supply became exhausted. He found it very satisfactory in selected cases.

Besides stovain and novocain, alypin and tropacocain have been introduced, but novocain has been generally adopted for the following reasons:

1. It is seven times less toxic than cocain when combined with adrenalin preparations.



2. Recovery from toxic doses is extraordinarily prompt.
3. It has very little action on the motor cells, thereby lessening the dangers of motor paralysis.
4. It stands boiling without decomposition.
5. It is absolutely free from irritating action.
6. It is physiologically compatible with adrenalin preparations.

Since the war novocain was not obtainable, but still having a supply of old tablets containing synthetic novocain and suprarenin, we continued to use the same until we were forced to stop on account of toxic symptoms, such as nausea, vomiting, faintness, dyspnea, sweating, rapid feeble pulse, pallor, etc. This we attributed to the fact that the suprarenin had lost its effect on account of the age of the tablet, allowing too rapid absorption of novocain, producing toxic symptoms. We also noticed that the anesthesia was fleeting, only lasting a very short time, which is characteristic of novocain when used alone. Recovery in all of our cases in which these toxic symptoms appeared was very prompt after giving them 1 ounce of whisky or a hypodermic of caffein citrate (grain  $\frac{1}{2}$ ), but in persons with poorly compensated valvular lesions who have no reserve fund of cardiac strength to draw upon death may be the result.

We now use apothessin, manufactured by Parke Davis & Co., and find that besides the advantages named under 3, 4, 5, and 6, it has the great advantage of being non-toxic, is slowly absorbed, and therefore can be used without adrenalin preparations. The anesthetic is lasting, and in not a single case did we notice any toxic symptoms.

Apothessin is conveniently supplied in tablet form, each tablet containing  $1\frac{1}{4}$  grains. These tablets can be depended upon in every way with the exception of their sterility; inasmuch as the dry substance cannot be sterilized, it is necessary to sterilize the solutions made from these tablets before use. These tablets will stand continuous boiling without decomposition.

Our solutions are prepared as follows: An ordinary test-tube, cork to stopper and beaker, are boiled for fifteen minutes

in water free from bicarbonate of soda. We specify this because the apothecin is chemically affected by alkalies. These utensils are then carefully rinsed in freshly distilled water. We now place about 3 c.c. of freshly distilled water in the test-tube, add the tablet, and then boil for five minutes. The solution is then poured into the beaker, from which it is drawn into the syringe either with or without spinal fluid. The specific gravity is approximately that of the spinal fluid—1009.

*Apparatus.*—We prefer a glass record syringe graduated to 10 c.c., as shown in Fig. 65. This needle is made of iridium-

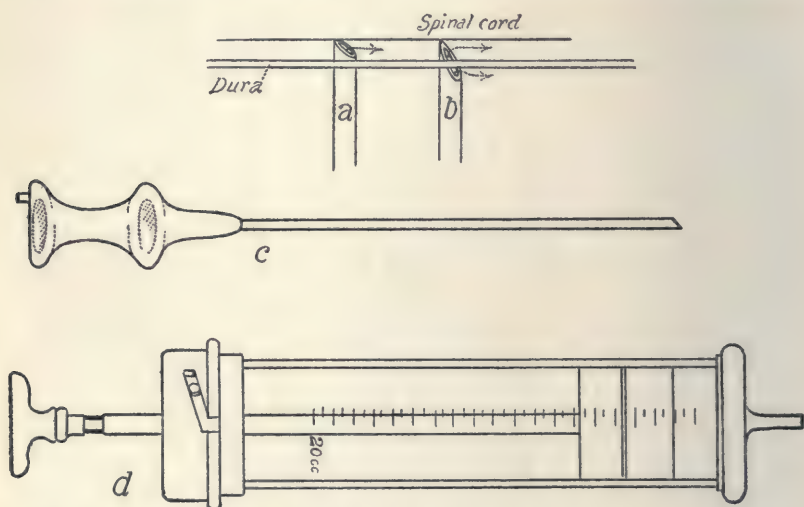


Fig. 65.—*a*, Correct angle of needle tip; *b*, faulty tip which permits escape of injection outside of dura; *c*, *d*, needle and syringe used by author.

platinum, is 10 cm. in length, and about  $\frac{1}{4}$  cm. in thickness. It is provided with a well-fitting stylet so as to prevent clogging of the lumen when introduced. The point is very sharp and the length of the point is only about  $\frac{1}{8}$  cm. A sharp point will pierce the skin and penetrate the dura painlessly, instead of pushing the latter in front of it and so causing failure. If the point of your needle is too long, it may only partially enter the sac, spinal fluid will escape, causing you to think you are within the sac, but when you inject the anesthetic solution most of

it escapes extradurally, again causing failure. The needle and syringe are boiled in plain water for fifteen minutes, then rinsed in freshly distilled water, because it is free of those invisible particles of foreign matter which we believe are the cause of the postanesthetic headaches, a much dreaded feature. Since using the apothesis our headaches are very slight, and in the majority of cases absent altogether.

*Preliminary Narcotics.*—We recognize the advisability of employing preliminary narcotics for the following reasons:

- (a) The patient comes into the operating-room without fear.
- (b) It makes him less susceptible to any possible pain contingent on spinal puncture.
- (c) A more profound anesthesia is obtained with a smaller amount of apothesis.
- (d) It acts as a guide to the amount of apothesis required.

In persons over thirty years of age we employ morphin sulphate (grain  $\frac{1}{4}$ ) and scopolamin (grain  $\frac{1}{160}$ ), divided into three doses: The first is given one and a half hours before operation; the second, one hour before; and the third, one-half hour before operation. It is rarely necessary to give a fourth dose, and in a great many the desired effect is produced by two doses. In persons below thirty years of age we omit the scopolamin and give the morphin alone, the entire amount (grain  $\frac{1}{4}$ ) being given one-half hour before operation.

In persons with marked respiratory depression, renal trouble, toxemia, etc., we omit the narcotic injections. In children we give sodium bromid, the dose of which is regulated according to age.

Preliminary preparation, such as diet, catharsis, etc., is unnecessary except in operations on the stomach and intestines. This makes it especially valuable in emergency surgery, the postoperative phenomena being the same as in those who have been carefully prepared.

Before entering the operating-room the patient is blindfolded and the ears are plugged with cotton to exclude all external stimuli. The patient is placed on the right or left side,



the back is aseptized with benzine and 4 per cent. tincture of iodine, which after five minutes is washed off with 95 per cent. alcohol. The field is draped with sterile towels; the operator, after observing strict aseptic precautions, identifies his landmarks. This is done by using as our guide a line drawn between the highest points of the iliac crests. This line crosses the middle of the fourth lumbar vertebra.

The spinal cord ends in the *conus terminalis*, from which springs the leash of nerves called the *cauda equina*, at the lower border of the body of the first lumbar vertebra. We select a site below this point in order not to injure the spinal cord. Between the first and second lumbar vertebrae the nerve roots are arranged in right and left bundles with a small space from 2 to 5 mm. between them; unless you strike this space you will inject into this bundle of nerves on either side, and you get a unilateral anesthesia which is deeper for the leg than the region above upon which you desire to operate. When this occurs the patient will jerk his leg and complain of pain. Below the second lumbar vertebra the nerve roots are more evenly spread out, filling the whole space, but leaving free room for the solution to filter through; when you enter here the *cauda equina* is generally pushed aside.

The site of puncture depends upon the height of the anesthesia required; when we require a low anesthesia we inject between the fourth and fifth, and when a high, between the second and third, lumbar vertebrae. In children we never inject higher than below the third lumbar on account of the cord ending opposite the third lumbar vertebrae. The height to which anesthesia extends depends, further, upon the amount of the solution—the greater the amount, the higher the anesthesia; and upon the amount of the drug—the larger the dose, the higher the anesthesia. We increase the amount of our solution by withdrawing and mixing sufficient cerebrospinal fluid to equal the amount required, as follows:

For perineum and external genitals, inject between fourth and fifth lumbar vertebrae; amount  $\frac{3}{4}$  grain, no cerebrospinal fluid.

For operations on the legs up to the groin the amount is 1 grain.

For low abdominal operations, below the transverse colon, inject between the third and fourth lumbar vertebræ; amount 1 grain, mix with about 4 c.c. of spinal fluid, making a total of 7 c.c. This brings our solution high enough to anesthetize the tenth intercostal, which innervates the peritoneum immediately



Fig. 66.—Needle inserted between third and fourth lumbar vertebræ at end of thumb. Thumb rests on tip of the third spine. Insert shows needle perforating dura mater.

above the navel; the eleventh, immediately below the navel; and lower down, the eleventh and twelfth intercostal nerves.

For high abdominal operations, above the transverse colon, inject between the second and third lumbar vertebræ; amount  $1\frac{1}{4}$  grain, mix with 7 c.c. of spinal fluid, making a total of 10 c.c. This brings our solution high enough to obtain complete loss of sensation of the serosa in the epigastrium, which necessitates

a paralysis of the sensory nerve roots in the subarachnoid space up to a level with the spinous process of the sixth dorsal vertebra.

We do not employ spinal anesthesia as a routine, but only in cases where a general anesthetic is contra-indicated and where a local does not answer the purpose. During the recent epidemic of influenza we have had emergency cases where we were obliged to operate while the patients were in the midst of a pneumonia. One particularly interesting case of this character occurred in a woman of twenty-six, pregnant, full term. She was taken ill with influenza pneumonia, and on the third day labor began with terrific hemorrhages due to placenta prævia. A cesarean section under spinal anesthesia was performed while she was having a temperature of 104.4° F. The baby lived and the mother made an uneventful recovery.



## CLINIC OF DR. THOMAS J. WATKINS

ST. LUKE'S HOSPITAL

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### POSTOPERATIVE CATHETER CYSTITIS (USUALLY MISTAKEN FOR CYSTITIS DUE TO INCREASED RESIDUAL URINE)

*Summary:* Frequent occurrence of cystitis after pelvic operations; history of case; work of Dr. Arthur H. Curtis on importance of residual urine in gynecologic cases; after-treatment of the bladder in gynecologic cases.

*November 21, 1918.*

THE frequent occurrence of cystitis after pelvic operations, especially after extensive plastic operations involving the anterior vaginal wall, makes the subject of great importance. From the observation of a considerable number of cases I am firmly convinced that the so-called postoperative catheter cystitis does not usually result from infection from the catheter, but from the presence of an increased amount of residual urine. The following case illustrates this contention:

Mrs. E., aged forty-five, consulted me for uterine prolapse, a large cystocele, and lacerated perineum. The uterus was about twice normal size. She had the usual symptoms of prolapse and also had some vesical irritability. Examination of the urine showed cystitis, and the use of the catheter immediately after urination showed on an average of  $1\frac{1}{2}$  to 2 ounces of residual urine.

The lesions were corrected by a modified transposition operation. A high amputation of the uterus was made through an incision in front of the cervix. The resulting stump was firmly sutured to the fascia underneath the trigone of the bladder. The sutures were placed so that when tied the urethra was drawn

upward to its normal location. The anterior lip of the cervix was amputated. The redundant tissue in the flaps of the anterior vaginal wall were resected and closure was made, care being taken to approximate firmly the fascia underneath the bladder. Some interrupted sutures were used to guard against the retention of much wound secretion, which in such a case would be certain to become infected and produce fever. A firm perineal body was made.

This operation resulted in considerable traumatism to the bladder, which was already infected and which had defective muscles as the result of having been overstretched and displaced. Following operation she had a partial bladder paralysis, which is common, and should be expected in such a case. Although she was able to pass some urine, it was nearly two weeks before the residual urine became normal in amount.

My attention was drawn to the importance of residual urine in many gynecologic cases by the work done by my associate, Dr. Arthur H. Curtis, which was reported in a paper presented to the American Gynecological Society in Philadelphia in 1918. His contention was that the use of the catheter in normal bladders did not result in cystitis; that bacteria were commonly passed through a normal bladder without producing cystitis; that experiments demonstrated that pathogenic bacteria could be passed through a normal bladder without producing infection.

For the past two years we have given careful attention to the question of increased residual urine, with the result that post-operative symptoms and findings are almost invariably proportionate to the amount of residual urine which the patient carries. The fact that bacteria are often eliminated through the kidneys means that bacteria very frequently travel through the bladder cavity, and in the case of the presence of a considerable amount of residual urine infection is very liable to result.

#### AFTER-TREATMENT OF THE BLADDER IN GYNECOLOGIC CASES

It has become our custom to test for residual urine as soon as bladder symptoms develop, and to catheterize at least once

daily until the amount of residual urine becomes normal, which is  $\frac{1}{2}$  to 1 dram. Instillations of silver are used after catheterization, commencing with a weak solution of  $\frac{1}{8}$  of 1 per cent., and gradually increasing the strength of the solution should progress not be favorable. Benzoic acid, 5 grains four or five times daily, is given in case the urine is neutral, and as soon as the urine becomes acid urotropin is ordered, commencing with 5 grains three times a day, and increasing the amount 5 grains each day until formalin appears in the urine. Then the amount is again diminished so that a weak reaction of formalin is obtainable. In case the urotropin produces an acute irritation, it is stopped at once, and large doses of sodium citrate are given until relief is obtained. The result of this treatment has been that the patients when finally discharged are cured of the cystitis. In occasional instances it is necessary to keep up some bladder treatment after the patient has been discharged from the hospital. We believe it highly important that such cases be kept under observation until the cystitis is completely cured for reasons which are obvious. We are convinced that chronic cystitis frequently resulted and persisted for a long time in many gynecologic cases with the treatments which were formerly employed.





## CLINIC OF DR. A. J. OCHSNER

### AUGUSTANA HOSPITAL

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#### HYPOSPADIAS

*Summary:* Technic of operation for the cure of hypospadias.

THE first step required in the operation for hypospadias consists in making a perineal fistula for the introduction of a catheter into the bladder in order that the plastic work will not be contaminated by urine. This portion of the operation is performed by introducing a steel sound through this opening of the urethra (Fig. 67, 1, A), and carrying it into the perineum (Fig. 67, 1, B). The skin and superficial fascia are retracted and the sound is pushed against the perineum, pushing forward the urethra (Fig. 67, 2). A longitudinal slit is then made in the urethra, and through this a catheter is introduced into the bladder. This catheter is held in position by a piece of rubber drainage-tube drawn over it, which, in turn, is fixed by means of a suture (Fig. 67, 3). In this manner all the urine will be emptied through the catheter and the field of operation will be entirely free from this source of contamination.

In this case the urethra ends at the scrotum. There is a marked degree of shortening of the penis because of a band of connective tissue extending from the lower end of the urethra at the base of the scrotum up to the meatus. In order to overcome this deformity it will be necessary for us to loosen this entire band by cutting its attachment at the lower edge of the band and freeing this connective tissue entirely. Unless we succeed in freeing this connective tissue, whatever else we may do will not be of much avail.

An incision is then made (Fig. 67, 4) and the flap is reflected laterally, leaving a raw surface underneath. Now we have

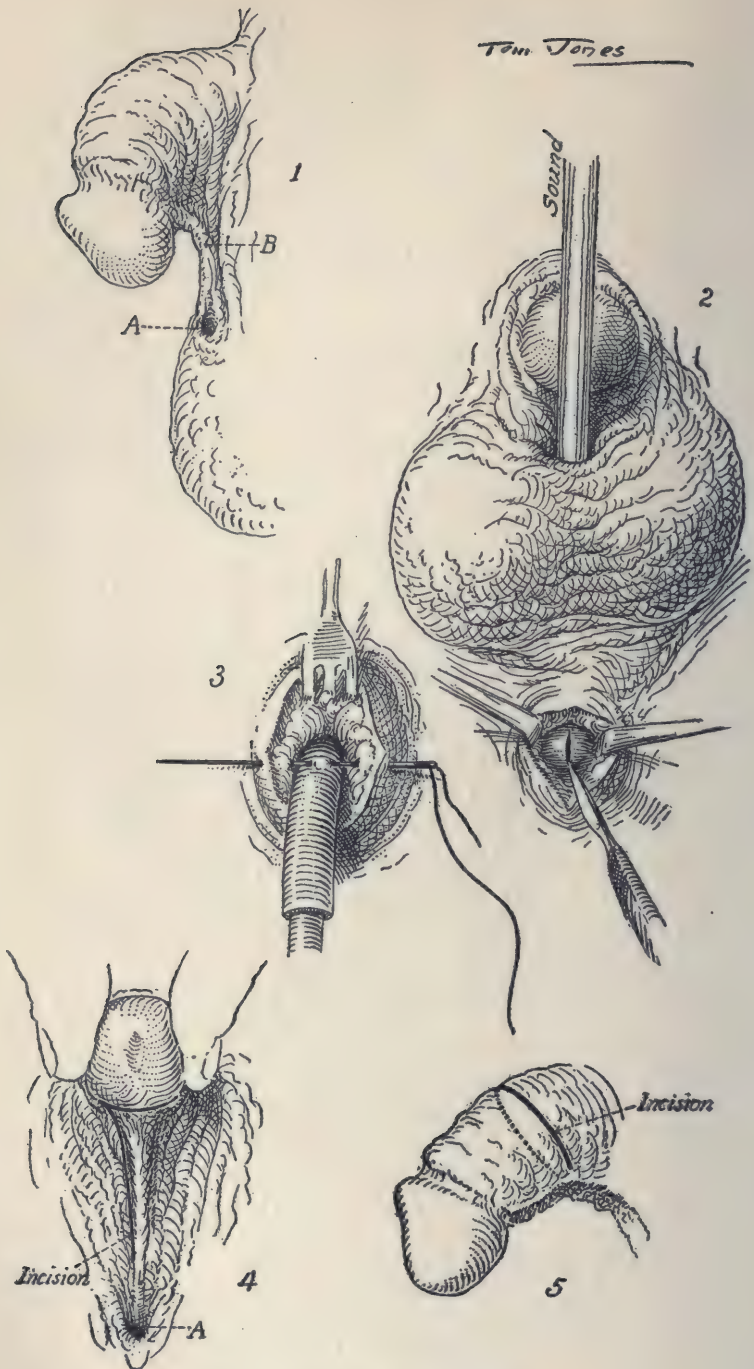


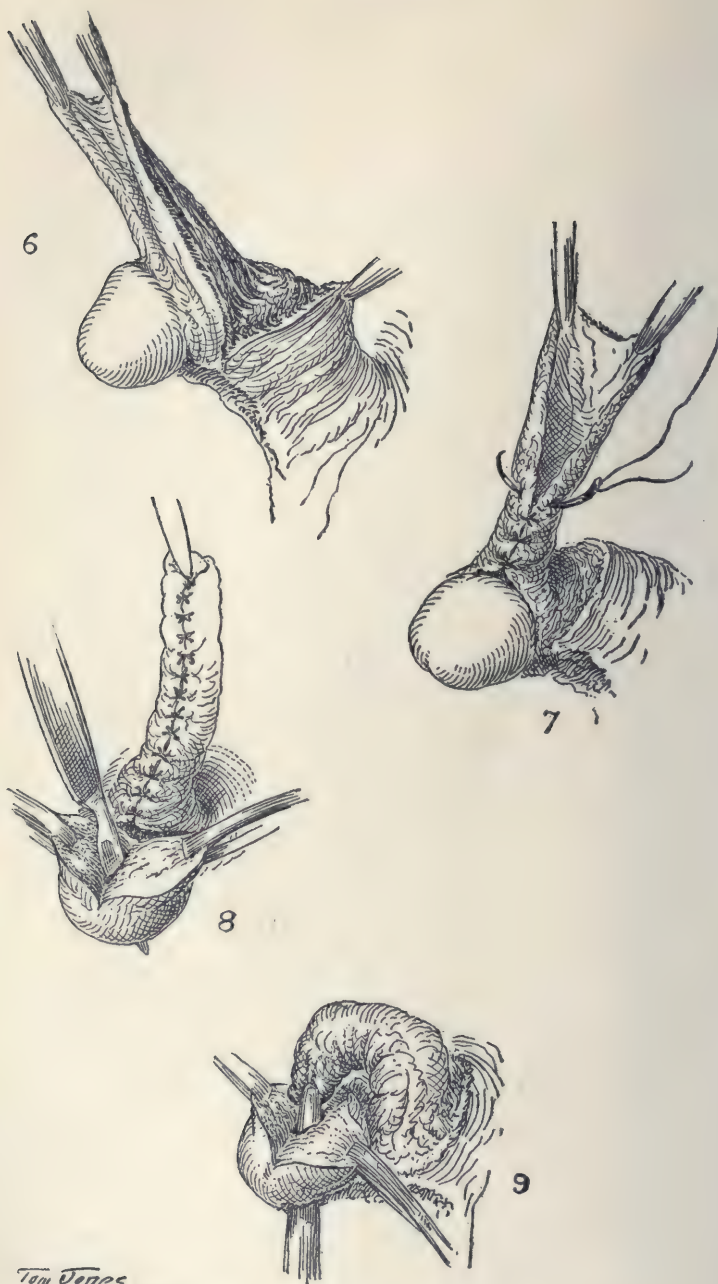
Fig. 67.—Operation for hypospadias.



loosened this adhesion, and you see that there is now considerable lengthening. The only way I can see to obtain an efficient urethra is by making use of this preputial tissue. The next step consists in securing tissue for the construction of a new urethra from prepuce (Fig. 67, 5).

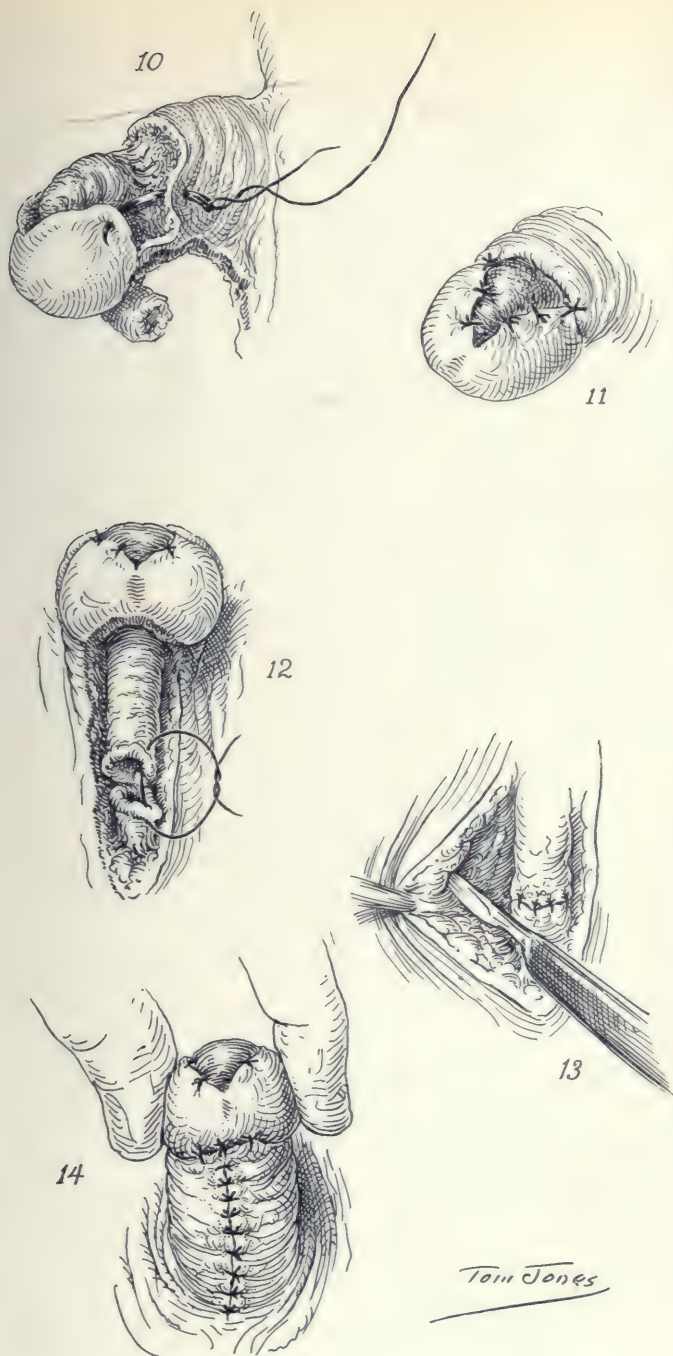
In order to make a urethra that will be satisfactory to him we must have a very large flap (Fig. 68, 6), and we must fold this in with fine catgut Lembert sutures, preferably interrupted (Fig. 68, 7, 8). These sutures must under no condition perforate the mucous membrane. They must come down to the mucous membrane and then fold the mucous membrane inward, so as to make a perfect channel, which will be much larger than we should wish ultimately, but we must bear in mind that there will be some edema, and that unless we have a superabundance of tissue the canal will not be large enough in the end.

The glans should be transfixed freely at this point (Fig. 68, 8), because in doing this I think it will be possible to fold in this long urethra in such a manner that there will be no danger of necrosis from pressure. That is a matter of which we have to be very careful. If we get pressure necrosis here our whole flap will slough off and our labors will have been in vain. Now I have a space here through which I can pass my fingers without any tension. I believe that I will be able to carry this newly formed urethra through this opening in the same manner by holding the edges of the wound in the glans apart by means of fine forceps (Fig. 68, 8). The line of incision from which the prepuce has been separated is next sutured to the raw edge in the glans (Fig. 69, 10), and a few additional sutures are so placed as to unite the remaining portion of the incision in the glans with the newly formed urethra (Fig. 69, 11). The end of the urethra at the edge of the scrotum is then carefully dissected out, and the free end thus formed is attached to the free end of the newly formed urethra, which has been carried down through the slit in the glans (Fig. 69, 12). The union between these two ends is accomplished with fine chromicized interrupted catgut sutures (Fig. 69, 12). Now it becomes necessary to free the skin on either side, making use to as great an extent



*Tom Jones*

Fig. 68.—Operation for hypospadias.



*Tom Jones*

Fig. 69.—Operation for hypospadias.



as possible of the flap which was shown in Fig. 68, 6, care being taken to secure an abundance of the free skin with which to cover the new urethra (Fig. 69, 13). These newly formed flaps are then sutured over the newly formed urethra, care being taken to have them sufficiently loose, so they cannot possibly give rise to pressure necrosis. The edge of the glans is sutured to the edges of these flaps, so that the entire operation is complete with the exception of the construction of a meatus. This may be accomplished immediately by making a longitudinal incision through the portion of the newly formed urethra which has been drawn through the glans, or this portion of the operation may be postponed until a few days later. Ordinarily it is a good plan to make this opening immediately and to carry about four strands of silkworm-gut through this opening down to the urethrotomy opening, and permitting them to pass out just above the drainage catheter in order that any accumulation of serum in the newly formed urethra may readily be drained away, and in order to prevent possible pressure necrosis which might result from an accumulation of serum. This operation is practically the one which was first described by Carl Beck some twenty years ago. It has proved very satisfactory in cases in which there was present a large prepuce and in which there has been sufficient amount of loose skin to cover the newly formed urethra.

A simple vaselin dressing is applied in order to prevent the child from soiling this wound surface. The child is kept in bed and given a moderate diet, and in order to prevent an accumulation of phosphates in the urine it is well to give a glass of distilled water with from 3 to 5 drops of dilute hydrochloric acid every three hours. The superficial stitches may consist of silk or fine catgut or, preferably, of horsehair.

## EXCISION OF GANGLION FROM HAND

*Summary:* Patient presenting a ganglion along flexor tendons of forearm, extending into palm of hand; treatment of small ganglia; operation in present case—findings.

THIS patient has a ganglion along the flexor tendons of the forearm extending into the palm of the hand. Pressing upon the palm of the hand causes the swelling in the wrist to increase. Apparently a number of tendons are involved. The ganglions in the palm of this hand cover approximately one-third of the palm. Ordinarily we try to dissect out the entire ganglion. In the smaller ganglia we sometimes puncture the swelling with a trocar and express a gelatinous fluid, and then inject a few drops of 30 per cent. phenol in glycerin and dress the hand with a tight compress, over which a bandage is applied. Very frequently with small ganglia that method will succeed. In large ones it usually does not succeed. We must dissect out the capsule. That is what we are going to try to do here. Of course, when it comes to the annular ligament it is difficult to make sure that we have removed the entire capsule. In case of doubt it is best to cut this ligament and to suture it with fine chromic catgut after dissecting out the ganglion.

It is in this case that we have one of those very rare lipomata that extends down into the palm of the hand. It is quite possible that this may be one of those instead of a ganglion. You see, as I cut down on it, that this swelling is covered with a little area of fat which gives it the appearance of a fatty tumor, but it is, in reality, a ganglion. Of course, we have to be very careful here. It is to be hoped that we can dissect this out without breaking it. I think this is full of rice bodies. We will make stained microscopic sections of these rice bodies because they are liable to contain tubercle bacilli. Rice bodies are little bodies about 5 mm. in diameter and 1 mm. thick that sometimes contain tubercle bacilli.

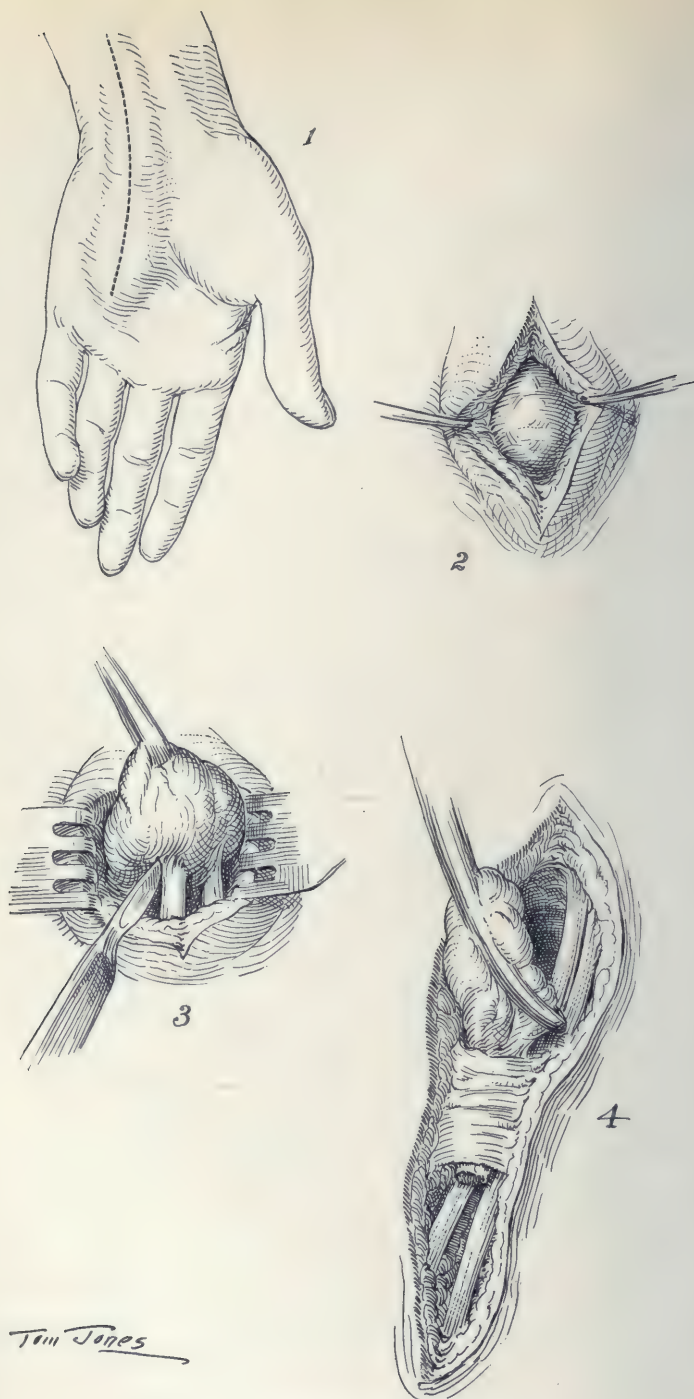


Fig. 70.—Excision of ganglion from hand.



This upper part extends into the wrist. We will dissect out as much as we can from this side and then we will attack it from above. At times it is difficult to find the ganglion from above, but in this case it is not at all hard to find, because after incising the skin and fascia it is plainly in view. In order to make a complete excision in this case I find that it will be necessary to cut through the annular ligament. After removing the ganglion we remove the Esmarch constrictor to control any points of bleeding before suturing the wound.

Now we will apply a few fine catgut sutures to unite the subcutaneous tissues. We will then apply a large pad and then fix the wrist and hand by means of a splint to keep the fingers straight while the wound is healing.



## CLINIC OF DR. MAURICE A. BERNSTEIN

### WESLEY MEMORIAL HOSPITAL

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#### TALIPES CAVUS (TALIPES PLANTARIS, CONTRACTED OR HOLLOW FOOT)

*Summary:* A type of foot deformity not recognized in the early stages; historic sketch; four types of acquired hollow foot; report of 3 cases—operative technique; bibliography.

THE cases which I desire to present this morning belong to a type of foot deformity which is not recognized in the beginning stages, owing to the fact that the symptoms are not sufficiently marked to be incapacitating. Later on, when discomfort manifests itself, relief is sought by specially fitted shoes. The condition, however, becomes progressively worse and the surgeon is finally consulted. This deformity is known as talipes cavus, talipes plantaris, contracted or hollow foot.

The condition was first described by Shaffer and later by Fisher, both of whom give an extensive description of the deformity. The title of Shaffer's paper, "Non-deforming Club-foot," is misleading, as you will see from the cases here presented and from the observations of other writers, demonstrating that the bony structural change of the foot is quite significant when it is fully established. Fisher, commenting upon the deformity, says, "A varus foot when the distortion is fully developed is a somewhat complicated piece of abnormality." According to Dubrueil, the first precise knowledge of hollow foot was gained from the work of Duchenne, of Boulogne, who described its genesis and pathologic physiology. He showed that there were four

*Erratum.*—"In Dr. Bernstein's clinic which appeared in the October Number, p. 1072, 3d paragraph, 18 lines from top of page, sentence should read: 'case of paralytic varus' instead of 'valgus.'"



types of acquired hollow foot, each having a different etiology, as follows:

1. Hollow foot due to contraction of the peroneus longus. This does not cause contracture of the toes.

2. Hollow foot due to paralysis of the sural triceps, which does not cause contracture of the toes.

3. That due to paralysis of the interossei, of the abductor, and of the short flexor of the large toe. Here there is a concomitant contracture of the toes. When these muscles are paralyzed there results, by virtue of the loss of their tonicity, a contraction of the extensors of the toes. These, in reality, act only on the first phalanges and therefore pull this phalanx up on the dorsal surface of the metatarsal.

4. In the contracted form of equinus hollow foot the equinus is the starting-point of the deformity.

Whitman in describing this condition says that there are two varieties, first, the simple hollow foot, perhaps hereditary in origin and becoming exaggerated when the individual wears a high-heeled shoe. The deformity is brought about, in this case, by a habitual plantar flexion of the foot. The other type is secondary to a transient form of anterior poliomyelitis or neuritis in early childhood. He calls the primary form *talipes arcuatus*, and the secondary type, in which the former is combined with limitation of the range of dorsal flexion at the ankle-joint, *talipes plantaris*.

The etiology of this condition is not definitely established. It is assumed by most authorities that the condition is the result of a mild attack of poliomyelitis anterior which is not recognized until the deformity manifests itself. The pathology also is not very satisfactorily explained. Broca, who made a complete dissection of a foot in a case of talipes hollow foot, found the following pathologic changes: The right sural triceps was almost completely degenerated. The three muscles of the deep bed of the posterior region were attacked to a lesser degree, a precise amount of the muscle being fatty and showing yellowish streaks in the middle of the healthy fibers. This was especially marked in the tibialis posterior. The peroneus longus was markedly im-

paired, especially in the interior bundle, the peroneus brevis and tibialis anterior being healthy. No alteration was found in the plantar muscles of the foot. The concavity of the feet was brought about by contraction of the plantar fibrous tissue. All the plantar ligaments of the foot were found shortened and contracted, especially the calcaneocuboidal ligament.

Binet and Heully and Bouvier lay stress on the bony structural changes of the foot. This view is emphasized by Fisher, who says that during the period of existing weakness of the flexor muscles of the foot the front part of the foot becomes slightly depressed at the transverse tarsal joint, the cuboid and scaphoid bones falling down from the os calcis and astragalus, and carrying with them the cuneiform bones, metatarsals, and phalangeals. The depression of the front part of the foot causes an approximation of the heel and toes with shortening of the sole. The plantar fascia, therefore, becomes secondarily contracted. Perkins gives as the pathogenesis of this condition paralysis of the interossei muscles (Duchenne); and second, weakness of the peronei muscles (Golding and Bird).

It seems, therefore, to be the consensus of opinion that the development of this condition is the result of paralysis of the interossei and lumbrical muscles, with a contraction of the plantar fibrous tissue and concomitant contraction of the extensors of the toes. The feet do not, as a rule, look badly. They are, in fact, looked upon as being well shaped, but when an imprint is taken of the foot it is noted that there is a great loss of treading surface. This loss is due to the presence of several small bands of contracted fascia stretching like bow-strings across the sole of the foot, which prevents it from spreading when placed upon the ground. In the normal foot the two poles of the longitudinal arch separate when the individual puts his weight upon the ground. There is considerable elasticity of the foot as a result of this spring-like action. When the plantar tissues become contracted the normal elasticity of this part of the foot is lost, so that the individual walks with a "stilt-like" gait, coming down upon the heel and the ball of the foot at the same time.

CASE I.—The first patient is a young man eighteen years of age. At the age of twelve years he had poliomyelitis, and since that time his feet have remained weak and have gradually become stiff. He comes to the Northwestern University Dispensary for relief of pain in his legs and ankles. His feet burn and perspire, and calluses have formed on the bottoms, which make walking very distressing. He says that he has difficulty in finding shoes to fit him.



Fig. 71.—Shows contraction of all the extensor tendons of the toes, with subluxation of the little toes. The extensor longus hallucis stands out very prominently, pulling the large toe out, simulating the condition existing in bunions.

On examination we find both feet deformed (Fig. 71). The feet are inverted and abducted, the arches are elevated, instep arched, and the toes contracted in the extended position, the large toe assuming the shape of a hammer-toe. Calluses are found on the bottoms of the feet over the metatarsophalangeal articulation. There is a marked protrusion over the instep. When we ask him to flex the toes he is able to do so to a very slight degree. When we depress the transverse arch he can flex the toes more readily. When we ask him to extend the toes they



assume an angular position. He is unable to extend the foot on the leg to the normal range of motion. The extensor tendons of the toes, *extensor communis digitorum*, are contracted, pulling the toes up and giving the foot the appearance of a "claw-foot." The *extensor longus hallucis* on the left side is very tense and shortened, abducting the toe so that the metatarsophalangeal articulation assumes the character of a bunion. You can see how the tendon of the little toe is contracted, subluxating the joint. There is also a well-formed corn on the upper surface of the toe which has given him considerable distress. The *peroneus tertius* is contracted. This is perhaps due to the filament which passes to it from the extensor of the little toe. There is considerable loss of extension at the ankle-joint.

He has difficulty in getting shoes which are high enough over the toes. He complains of cramping pains in the calf muscles. After walking long distances the muscles in the calf twitch, so that he cannot find a comfortable position for his limbs at night. He has a peculiar gait, more or less shuffling in character.

I am going to cut the plantar fascia close to the *os calcis* and attempt to correct the deformity by extending and everting the foot. I shall also do a subcutaneous tenotomy of all the extensor tendons of the toes. In doing the tenotomy I use a long-bladed thin tenotome. A small incision is made over the middle toe, the tenotome is inserted, and all the tendons are cut through this one opening. Most operators make an incision over each tendon, but this is not necessary, since all the tendons can be reached through one incision. One silk suture is employed to close the skin incision. The wound is covered with a small dressing and a plaster cast is applied, extending from about the middle of the leg down to and including the toes. While the cast is being applied the assistant makes pressure with his thumbs over the transverse metatarsal arch, so that after the cast sets a convexity is produced over that portion of the foot, forcing the arch up and straightening the toes.

The patient will be permitted to put weight on the foot about the third day, and at the end of a week the cast will be removed and the patient allowed to walk. As soon as it is expedient

metal plates with a convexity over the ball of the foot will be inserted in his shoes. It is important to instruct these patients regarding the wearing of proper shoes. It is also important not to rely entirely upon the operation for ultimate cure. It is necessary to stretch and massage the toes and the foot for some time after the operation. If the correction following the simple means employed in this case is not complete, it will be necessary to forcibly correct the foot with a Thomas wrench. One must be certain that all the contracted tissues on the sole of the foot



Fig. 72.—Typical hollow foot, showing marked elevation of longitudinal arch with contraction of the phalanges. Notice the prominence of the metatarsophalangeal articulation of the large toe.

are cut before the forcible correction is attempted. After cutting the inner portion of the plantar fascia the foot can be forcibly extended. It can be seen that other fibrous bands are still intact and will have to be severed. In the simple contracted foot, especially in children, massage, forcible manipulation, and stretching bring about good results. In young individuals the foot is pliable and yields to manipulative redressment more readily than does the foot of an adult.

CASE II.—This boy is ten years of age. When he was four he had an acute attack of a febrile condition which was diag-

nosed poliomyelitis. It left him with a weak right foot and a distinct limp. While he can run and play without much impairment of gait, his foot troubles him after overexertion.

On examination we find the longitudinal arch elevated and the toes contracted prominently when he extends his foot. The



Fig. 73.—The right foot is abducted and slightly inverted. It can be seen that the toes do not touch the ground. The transverse arch is broken down, so that the patient's weight is thrown upon the heads of the metatarsal bones. Notice that the large toe is abducted, pushing the second toe up.

metatarsophalangeal articulation of the large toe is thickened and prominent on the plantar surface. The limb is slightly smaller than the opposite one. When he walks he tilts his body forward upon the weak foot, due to a lack of stabilizing action in the large toe (Fig. 72).

This foot will not be operated now. A cast will be applied,



placing his foot at a right angle and depressing his transverse metatarsal arch. The cast will be kept on for about two weeks, during which time he will be permitted to bear weight upon this foot. On removal of the cast a plate with the convexity over the ball of the foot, elevating his transverse arch, will be worn inside the shoe.

CASE III.—This man is twenty-four years old. He knows nothing about the diseases which he had when a child. He



Fig. 74.—Skiagram of Case III, showing elevation of the instep and separation of the upper surfaces of the scaphoid, astragalus, and internal cuneiform bones. Notice the proximity of the metatarsal heads to the tip of the os calcis, with a density of the plantar fascia. Notice also the slope of the metatarsal bones, with angulation at the metatarsophalangeal articulation. This is in contrast with Fig. 75, a normal foot.

says that since childhood he has had painful feet. His feet are rigid and he has difficulty in finding comfortable shoes. He first learned of the deformity when he was rejected for active military service.

The symptoms and clinical findings in this case are the same as in the preceding ones, with the exception that here the tendo achillis is contracted, elevating the heel and turning the foot

into an exaggerated varus position (Fig. 73). When he stands upon his feet you can see that the toes do not touch the ground. The x-ray picture (Fig. 74) shows a marked space between the upper surface of the tarsal bones, with considerable narrowing of the longitudinal arch. The metatarsophalangeal articulations are sunken, with an angular position of the phalanges. This is in contrast to the conditions found in a normal foot



Fig. 75.—Skiagram of a normal foot.

(Fig. 75). We will perform the same operation here as we did in Case I.

*Postscript.*—The two operative cases are much improved. The man who was disqualified from active military duty has since been accepted.

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# SURGICAL CLINICS OF CHICAGO

Volume 3

Number 2

CLINIC OF DR. E. WYLLYS ANDREWS

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## CHOLECYSTECTOMY AND THE MANAGEMENT OF THE PROXIMAL STUMP OF THE CYSTIC DUCT

*Summary:* Reasons for and against cholecystectomy—recurrence of symptoms following "ectomy"—technic which minimizes postoperative complications.

IN this patient the conditions require a cholecystectomy, or removal of the diseased gall-bladder packed with stones, rather than simple section and removal of the stones.

Inasmuch as the walls of this distended gall-bladder are thickened and may contain the nuclei of future stones, and as there are no contraindications, we prefer the "ectomy," lest this organ should keep up a biliary fistula or again become septic and require operation.

We are now confronted with some of the obstacles and objections hitherto pertaining to cholecystectomy. In the first place, removal of this organ does not give immunity from recurrence. Next, it may be that in so removing it we deprive ourselves of a useful appendage should we later require drainage of the gall-tracts either externally or by a cholecystenterostomy into the intestine. Secondary operations are often easier if the gall-bladder has not been removed. But in spite of these objections our routine in this type of case is total extirpation of the gall-bladder. One form of recurrence after ectomies is the surprising appearance of what seems like a new gall-bladder. We know now that this is only the dilated proximal stump of the cystic duct, which in the course of months or years may be dilated into a cystic cavity resembling the old gall-bladder. The results of our work have been much better since we paid

attention to the radical removal not only of the gall-bladder but also the entire length of the cystic duct. As this is a small tube, somewhat tortuous, and in certain cases obliterated, it is

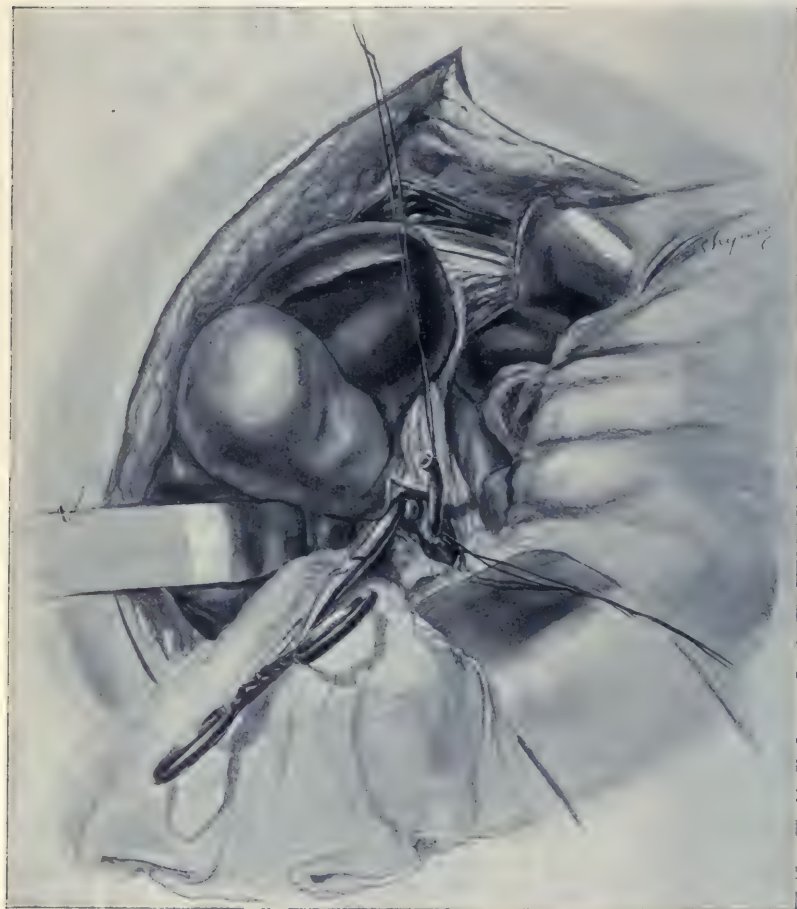


Fig. 76.—Cystic duct straightened by traction and ligated close to common duct.

by no means easy to be sure we have amputated it at the actual junction point with the choledochus. The technic which I now show is a simple and easy method of ensuring its total removal. As you know, the bent forceps usually placed upon the duct

can be applied either with or without a subperitoneal dissection, that is, we may clamp the whole pedicle or we may split the serosa and isolate the cystic artery and cystic duct so as to ensure that only these structures are seized. The latter is the method of choice of all careful surgeons, inasmuch as clamping the ligament without first opening the peritoneal fold, as one would seize the broad ligament in a hysterectomy, involves some danger of injury to the common duct. The technic I now employ includes the use of the clamp for the distal side only,

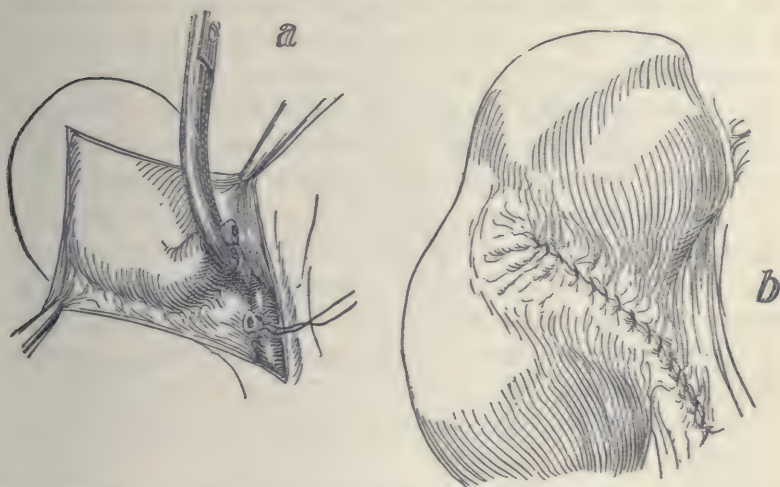


Fig. 77.—*a*, Gall-bladder in process of enucleation; *b*, peritoneum closed over site of gall-bladder.

and, as you note, a fine aneurysm needle with ligature on the proximal side which I tie firmly before dividing the duct. As you see (Fig. 76), I now have this duct anchored to the silk ligature, and as I make traction upon it can gradually free it cleanly down to the wall of the common duct. You will notice that it is angulated and slightly longer than we would expect, that it lies almost in contact and parallel to the common duct for 1 to 2 cm. Now, had I grasped it along its insertion with these duct forceps, I would have had to leave either a considerable piece behind or else injure the common duct with the edge of the forceps, but as I stretch with the traction of this



ligature, I can bring it completely into view, and I can now make a second amputation under the ligature very close to the outlet. This will complete the removal in this case, but in many other instances I deem it better not to ligate, but to cut it close and introduce a probe, split the common duct and explore it in both directions, introducing then a T-shaped tube which will permit of choledochus drainage during the after-treatment.

The remaining steps of the operation are a separate ligation of the cystic artery and the subserous enucleation of the body and fundus of the gall-bladder, with closure of the peritoneal flaps so as to obliterate the raw surface next to the liver (Fig. 77). In this case I shall close the wound without drainage, as I feel sure that the sutured cystic duct, again reinforced with peritoneal covering, will not leak bile after absorption of the ligature. This has been advocated by Willis, of Richmond, and is no more to be condemned than a similar procedure with the vermiform appendix or fallopian tube. But it is not well adapted to cases of cholangitis or severe sepsis, in which I feel it best to drain—preferably through a stab wound just in front of the right kidney—lest the peritoneal stump leak some bile during the healing.

## USE OF KANGAROO TENDON AND SPUN THREADS OF TENDON AS SUBSTITUTES FOR CATGUT

I WISH to call your attention in this operation of simple inguinal herniotomy to the technic of the animal ligature employed. Throughout this operation I shall use no catgut, but only kangaroo tendon in the form of natural strands and also in the form of spun tendon fiber for smaller sutures and ligatures. For the deep rows of sutures I am using four mattress stitches of kangaroo, which you see is very stout and composed of parallel fibers. The tendon which I hold up is thoroughly dry, having been taken from strong alcohol and, as you notice, is very coarse and splits spontaneously into three fairly large threads. Each of these threads is larger and much stronger than No. 2 chromic catgut, so that this one specimen of tendon furnishes three strong sutures.

Up to about a year ago I used the tendon only for the deep row of sutures in herniotomy, the outer rows and vessel ligatures being catgut. Inasmuch as numerous cases of defective catgut have been reported from many of our best clinics, especially during the past winter, we became dissatisfied with chromicized catgut, and I made my second row also of the tendon, choosing the slender strands. In the course of splitting these strands I noticed the tendency of the material to shred into small skeins of cottony fiber, which could readily be spun into a comparatively smooth type of thread. By combing, pounding, and teasing we soon found that we could convert dry kangaroo tendon into a material resembling loose silk or cotton fiber, that is, small skeins of fine filaments. These, in turn, could be spun by twisting with the fingers into fairly uniform threads of a sufficient length, having great strength, and we have substituted such threads for ligatures and sutures in various operations, thus doing away entirely with the use of catgut in wounds. It is true that most of our troubles have been from the chemical

irritation of the catgut, and some gut has been very good, but I have found the results consistently better with tendon, and I am positive that we have far less local and general reaction, and practically never serous or purulent collections around the knots or ligatures.

It would be comparatively simple to manufacture this spun thread by machinery, and I have such threads prepared for my clinic in such quantity that they can be kept on spools and reels like ordinary catgut. In the meantime we are thoroughly converted to the idea of keeping chromicized, iodized, or formalized catgut out of our patient's wounds, and do not expect ever to return to their use.



## MULTIPLE DRILLING OF FRACTURES—AN OLD-FASHIONED OPERATION REVISED

*Summary:* Failure of the "Lane technic" to insure aseptic healing; the Parham-Martin band as a cause of non-union; the Brainard drill—technic—twenty holes better than ten.

THE complications and drawbacks to the use of plates and foreign bodies in simple fractures of the long bones are far too common. In assisting in the preparation of the monumental book of Dr. Kellogg Speed on Fractures and Bone Injuries the writer and I, working in two hospitals, used Lane plates, intramedullary bone-pegs, and Parham-Martin bands in upward of a thousand recent injuries. Knowing that in the best of clinics these appliances had given a large percentage of infections and bad results, one of us, Dr. Speed, made a special trip to London, and in two or three months thoroughly studied Lane's own work and analyzed his methods as carefully as possible. What we termed the "Lane technic," which has been studied by both of us personally under Mr. Lane, we then adopted in its most rigorous form, especially in Cook County Hospital, where I was enabled to assign a very large operative material to our clinic.

As you know, Lane's technic implies that nothing except steel instruments thoroughly boiled shall touch the inside of the wound; no fingers, however carefully gloved; no needle or thread which has touched the fingers, and nothing but the steel goes within the skin. This means that all ligatures must be knotted with a pair of forceps and that all needles must be threaded without handling. All instruments must be handed by the nurse with forceps or special tongs. While at first it seems clumsy and tedious, one soon acquires a facility which makes the operation as speedy as the older methods.

In spite of our almost religious care in these respects, we had no absolute immunity from secondary infection in the use of bone-plates, wires, bands, and intramedullary pegs, although it was our claim, and I think justly, that we had reduced them to

a minimum. Neither do I find in the results of clinics here and in other large cities that they have such immunity. It has, therefore, been my constant aim to find some substitute for the routine use of these crude appliances.

These two cases, a fracture at the lower third of the tibia and one at the middle third of the radius, illustrate the imper-

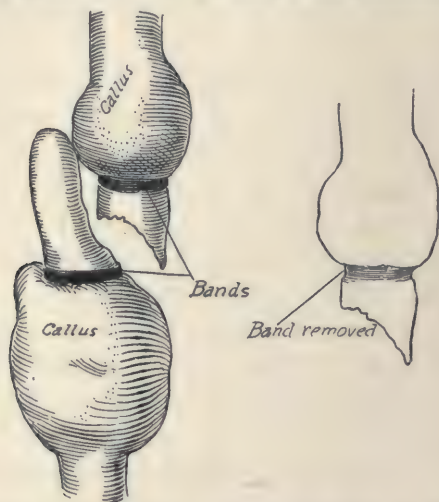


Fig. 78.—The former incision was reopened down to the seat of the re-fracture. There was no evidence of any infection in the soft parts. The fragments were exposed and showed the condition as seen in the accompanying drawing. The bands had been placed separately around each fragment and were applied so tightly that they were removed with great difficulty, and there was a distinct depression in the bone where the bands had been placed around them, due to pressure atrophy. The callous formation apparently stopped abruptly at the point where the bands were applied. This was especially true of the lower fragment. There was lateral overlapping of the fragments to the extent of about 2 inches.

fect success attending the use of the Parham-Martin band, one of the simplest and mechanically most perfect of the metal appliances. No means can be found mechanically better than an encircling band to hold some oblique fractures. I have always used wire circlets and later kangaroo tendon encirclements on oblique fractures of the femur, tibia, humerus, and other bones, but the Parham-Martin band is extremely easy of application and gives stronger support, so that one is tempted

to employ it whenever the obliquity of the fracture makes it spiral. These two cases and two others, both in the tibia, which I am now watching, were all corrected this way. All were cases of non-union with the bones in perfect apposition, which non-union I can only attribute to the cutting off of the nutrition by the powerful band. As you know, we set this band in position with a powerful screw tractor, and thus the distal portion of the fragments have their periosteum strangulated. Figure 78 shows how these distal ends apparently become atrophic and, while not septic, have brought about delayed union. After waiting from six to ten weeks while the x-ray showed a perfect relation of the fragments, the fact of non-union became too obvious to be ignored, and in these 4 cases above cited I had to remove the band by a cutting operation. In all but one case the parts were healed and aseptic. We had now in each of these 4 cases to deal with an ununited fracture in most ideal apposition, and I am positive that the constricting action of this band was responsible for the delayed repair.

Now non-union or delayed union is one of the old complications of fracture, both simple and compound, and was very well dealt with by our predecessors by that old-fashioned operation done with a Brainard drill. Brainard, a pioneer surgeon of Chicago and the West, early discovered that all ununited fractures could be made to repair by perforating their adjacent ends with multiple drill holes. One of the drills in his outfit had a very broad end and was intended to pass between the opposing fragments, and when rotated it tore out the interposed threads of fascia. But most of the drilling was a mere perforation, preferably obliquely, from one fragment across to the other. Thus from six to twenty small holes such as one would have made were a saw used were made to irritate the end of these fragments. This could be done through one to two minute punctures and the wound immediately sealed. Within a few days after such treatment rapid hyperplastic irritation and new bone formation took place. In ten to fourteen days, if there was no sharp osteitis and swelling around



the broken ends, the drilling was repeated. Thus in one or two stages the exudation of the provisional callus was so stimulated that bony union rapidly followed.

In this case of the forearm you will observe the spindle-shaped enlargement around the radius at its middle, which I showed you three weeks ago with a flail-like fibrous union six months after injury. The Parham-Martin band which was used, and which I removed, had given no union.

Exactly identical conditions were found in this young woman's leg from which I removed a Parham-Martin band one month ago. For six months the band had caused no trouble until I ordered her to walk upon the limb, after which a slight sinus developed, due to the mechanical trauma rather than an infection. I am now drilling with an electric rotary hand drill through a single opening about a dozen holes obliquely from one fragment to the other. Of course, we must ordinarily employ a general anesthetic. No cast will be used in this case, as we already have the fibula well united and a strong fibrous union with only slight mobility.

*Note.*—Four weeks after this operation a large provisional callus was developed, and it was found that the tibia had firmly united.

I believe that the most powerful agent in our hands to institute either as primary or secondary measure is the perforation of the broken bones by a drill. Probably some of the value of wiring bones or of plating bones comes from excitation of the drill holes. I am able to demonstrate beyond doubt that the drilling of broken bone ends invariably sets up free deposits of the callus and brings about union.

Sometimes the drilling must be repeated in from ten to fourteen days, or even a third time, since the reaction to it is much slower in some individuals than others. Therefore we have been driven by experience thoroughly to pierce and perforate in ten or twenty places rather than trust to a smaller number of bone punctures.

## CLINIC OF DR. A. J. OCHSNER

### AUGUSTANA HOSPITAL

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#### FRACTURE OF HUMERUS

*Summary:* Fracture of upper end of humerus in a child six years of age; failure to obtain proper reduction by external manipulation; treatment by internal fixation with Lane plate; postoperative dressing and care.

THIS case is that of a boy six and a half years of age, who broke his shoulder last Wednesday, five days ago. An attempt was made to reduce the fracture by manipulation, and the x-ray shows to what extent this was accomplished (Fig. 79, *a*). The upper end of the lower fragment touches the lower end of the upper fragment to the extent of about 1 cm., but the upper fragment is only 4 cm. long, and it was found impossible after a very careful attempt under an anesthetic to further correct the position of the fragments. It is very likely that we will find that the lower fragment is perforating the deltoid muscle and has been caught in the fibers of this muscle, and that this is preventing its adjustment.

We will make an anterior incision (Fig. 79, *b*), drawing the deltoid muscle backward and exposing the fragments, and then we will apply a Lane plate. The important points in this operation will consist, first, in getting an absolute adjustment, so that the two ends of the bone are in precisely the position in which they were before the fracture occurred. This will be an easy matter to accomplish in this case because the fracture is in the form of a fork, and by placing the projection in the upper fragment into the depression in the lower fragment we will succeed in getting a perfect adjustment.

The next important point is to have a steel plate that is strong enough to hold the bone in place and still short enough not to interfere with the shoulder-joint.

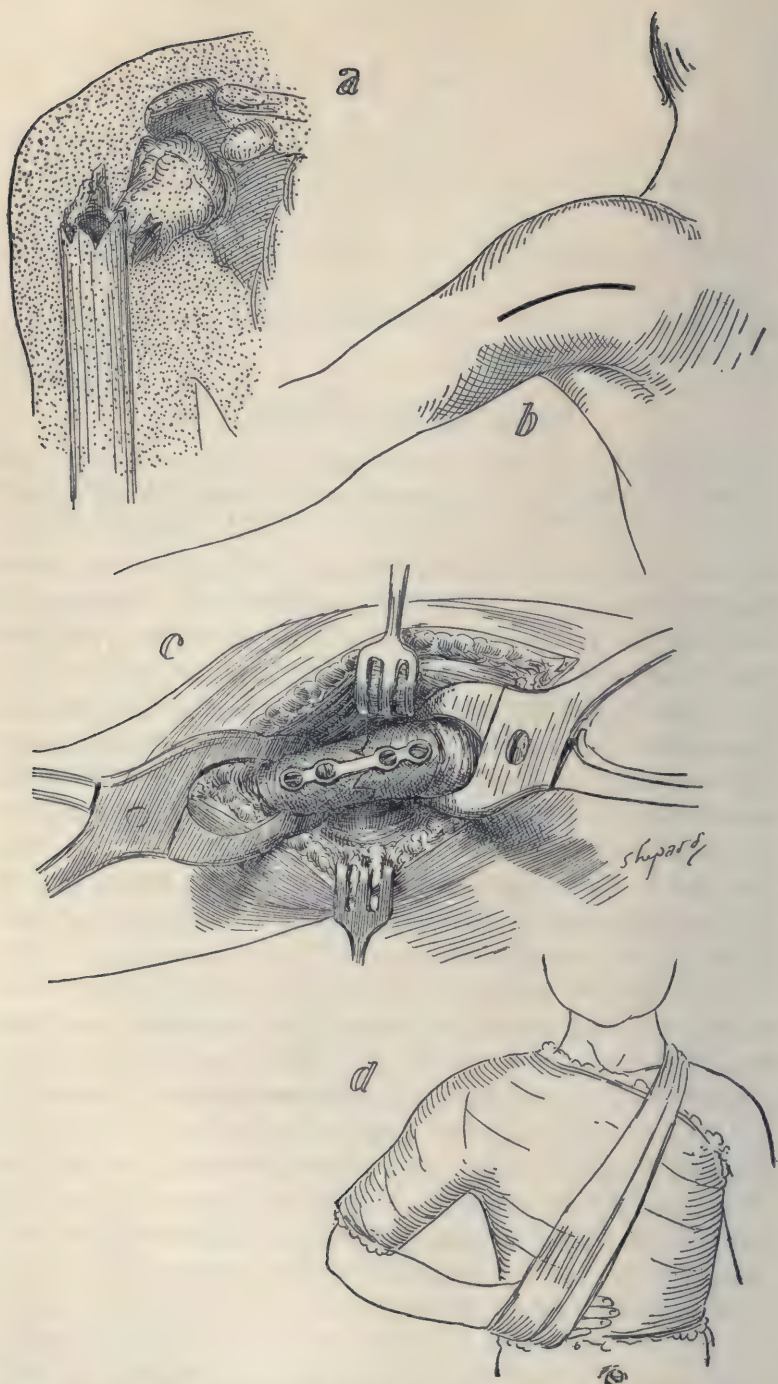


Fig. 79.—Fracture of upper end of humerus: *a*, x-Ray appearance of fracture; *b*, line of incision; *c*, application of Lane plate; *d*, final dressing.



The most important point is, of course, to perform the operation in an absolutely aseptic manner. This we will do by carrying out Lane's directions to the letter. Dr. Percy and I have performed the operation more than 150 times, and in less than 6 per cent. of our cases has it been necessary to remove the plate. If the operation is not performed on the absolute conditions laid down by Lane, more than half the plates have to be removed afterward because of some slight infection.

I think we can make this adjustment by taking the anterior route and by going in just underneath the anterior edge of the deltoid muscle. We touch absolutely nothing with our hands. The dissection down to the bone is carried out with the greatest gentleness. The tissues are dissected with a sharp scalpel and they are not traumatized unnecessarily in any way. The retractors are applied with care and gentleness, and the amount of force applied to them is sufficient only to hold them in place and not sufficient to traumatize unnecessarily. An area sufficiently large for the application of a Lane plate is freed by separating the muscle, leaving the periosteum in place. The upper fragment projects into the fibers of the deltoid muscle, it is freed from this entanglement, and then each of the fragments is grasped by means of a pair of lion-jawed forceps, which are applied carefully so as to reduce the traumatism to a minimum, and with these the fractured ends are approximated, so that a perfect adjustment is made.

While the fragments are held in this accurately adjusted position a Lane plate 12 cm. long is placed over the anterior surface of the bone. A hole is drilled, slightly smaller than the screw to be applied, at the upper end of the Lane plate. The first screw is then inserted, holding the upper end of the Lane plate in place, but this screw is not forced down to its greatest extent at the present moment. The next hole of the same size is drilled through the lowermost hole of the plate and a screw inserted in the same manner. Then the third and fourth holes are drilled and the screws applied successively. Now that all of the screws are in place, they are all successively tightened until they are permanently set as tightly as they can be forced

by means of a screw-driver and hold the bone in perfect position with great firmness (Fig. 79, *c*). The tissues are then sutured by means of fine catgut in three layers and the skin sutured with either fine catgut or horsehair. An ordinary antiseptic dressing is applied and then a plaster-of-Paris cast, including the chest, arm, and forearm, the arm being placed nearly at right angles with the body and the forearm about at right angles with the arm (Fig. 79, *d*). This will prevent the boy from making any sudden motion which might break the Lane plate. We will leave this cast in place for a period of five weeks, when it will be removed and an ordinary shoulder-cap splint will be applied.

In the case of an adult we would permit the patient to be up in a day or two. In the case of a child it would depend entirely upon the temper and obedience of the youngster. If he is head-strong, he will be kept in bed the entire time. If he is sensible and obedient, he may be permitted to be up in a few days.

## UNUNITED FRACTURE OF THE HUMERUS

*Summary:* Ununited fracture in a woman thirty-nine years of age; cause of non-union; care of musculospiral nerve; importance of complete hemostasis.

WE have another case of fracture of the humerus for operation this morning, this one being an ununited fracture which we shall treat with either a bone-graft or a Lane plate, according to the condition found on exposing the bone.

This patient is a woman of thirty-nine years. In 1917 she fell backward on the sidewalk, striking her elbow. She heard a snap near the elbow and the arm became powerless. A splint was applied for seven weeks; when it was removed and the patient began to use the arm she noticed an undue amount of lateral motion. This has increased until at the present time she is unable to raise the arm to a horizontal position. She can use the arm for lifting and has good use of the fingers and hand. She complains of neuralgic pains in the arm.

Examination shows a fibrous union of the fracture at the junction of the lower with the middle third of the bone, with considerable callous formation. There is  $\frac{1}{2}$  inch shortening of this arm.

We will have to be careful in making this incision not to cut the musculospiral nerve, which you know comes around the bone very near the point of this fracture. I am splitting the muscle-fibers in order to protect the nerve. There are two points I want you to bear in mind, the first is to get accurate hemostasis, and the second, to be careful of the nerve. As long as you have the nerve before you, you are safe. In this case the musculospiral comes around the humerus a little lower down than in the average case. Here we have found a definite reason why union has never occurred. There is a piece of fascia between the ends of the fragments. I must dissect out this fascia in order to give the bone a chance to unite. Now you see the



position of the bone is perfect, and I will insert a Lane plate in the same manner as I did in the first case this morning. The nerve will be protected by this muscle. We now remove the constrictor, and if there is any bleeding we will ligate the vessels. We are closing the wound exactly as in the previous case.

## FRACTURE OF THE PATELLA

*Summary:* Comminuted fracture of patella in a man of sixty; treatment by suture with chromicized catgut; history of silver wire for suture; comparison of results following operative and non-operative treatment; importance of early mobilization.

THIS patient, a man sixty years old, entered the hospital with a comminuted fracture of the left patella last Friday morning. He also had an oblique fracture of the lower end of the right fibula. These fractures were the result of an automobile accident. The patient was shocked considerably, so we put him in bed, elevated the foot, and kept him quiet for a few days in preference to operating at once.

The knee is filled with blood-clots, but the hemorrhage has undoubtedly stopped, so that having applied an Esmarch constrictor I am confident that we still have very little if any hemorrhage. We will take the same aseptic precautions as we did in the last case in which we applied a Lane plate in an ununited fracture of the humerus.

We make a horseshoe incision and lay back the skin-flap in order to expose the comminuted patella. There is only a small fragment that remains attached to the ligamentum patellæ. He must have given this patella a tremendous blow because it is broken into a number of pieces, and the lower fragments are separated 4 cm. from the upper. All the clotted blood from the broken edges of the patella is removed and from the cavity in the joint in order that we may be able to get a perfect approximation of the various fragments of this patella.

Our first suture extends through the internal lateral ligament, bringing the fragments together on the inner side. The next suture is applied to the external lateral ligament, which brings the external fragments in perfect apposition. Now we adjust the various bone fragments so that each fragment is put into its own place. The sutures are applied so that the edges are carefully adjusted.

For many years we have sutured all of our fractured patellæ with chromicized catgut. It is now twenty-three years since we abandoned the use of silver wire. The reason for abandoning silver wire was, first, that we found that our results were perfect with the use of chromicized catgut, and second, because of an experience I had in a clinic of the University of Edinburgh. Professor John Chiene was operating a very bad inguinal hernia in his clinic. I had just visited one of the German clinics where they were closing these hernias with silver wire, and so I asked Professor Chiene whether he had ever used silver wire in these cases. He said he never did and for a very good reason. He said there was a surgeon in Edinburgh who operated with silver wire thirty years ago and he was still taking out the wire for him, so that set me to thinking, and I recalled at that time quite a number of cases in which the patients who had been operated with silver wire elsewhere later on came to our clinic to have the wire removed. At that time I was chief assistant to Professor Nicholas Senn, in charge of the clinic at Rush Medical College, and we had patients come who had been operated with silver wire from all parts of the country greatly dissatisfied with the primary operation, because they had to be annoyed by a second operation for its removal. Our results have been very satisfactory with chromicized catgut, and we have adhered to its use ever since.

You see we have carefully adjusted the bone in this case with chromicized catgut. It is sufficient to hold the bone in position until union has taken place. Now we turn our flaps back and we have a perfect adjustment, so we carefully suture the fascia over the anterior surface of the patella.

I had this interesting experience in a patient entering the hospital who had broken his left knee-cap. The right knee-cap had been broken in exactly the same way by falling upon a stone pavement. As it happened, both fractures occurred precisely in the same manner, in fact, on the same pavement. The injury was exactly alike in both patellæ. In the first fracture of the right patella the treatment employed was the usual treatment of immobilization to the best possible extent by means



of a posterior splint of adhesive plaster strips. After three months the patient was able to walk with a cane and to perform the duties necessary in his office, but he never was able to walk without a limp. His left knee-cap was operated according to the method which has just been illustrated to you. In two weeks the patient was able to go home and walk with a cane, and after five weeks he was able to take up the work in his office, walking without a limp, and three months after the injury occurred his left leg was as good as ever. There was not the slightest limp or hitch on this side, while his right limb in which he broke the patella four years before was still lame. It is now more than twenty years since this operation was performed. I see the patient occasionally and he still laments the fact that his right limb was not treated by the operative method, because as his age increases the difficulty continues to become worse, while his left limb is perfect.

This has been our uniform experience with this operation, and I am confident that the patient before you will have a similar experience. For a number of years we applied plaster-of-Paris casts in these cases. This we have abandoned entirely. We apply an ordinary dressing for about ten days, when the sutures are removed, and then an Unna's paste dressing is applied extending from a point 15 cm. above the patella to a point 15 cm. below. This dressing is elastic and permits the patient to make active motion. He is permitted to walk on this leg at this time, and in five to six weeks he can take up his occupation. In this manner the muscles of the thigh do not show the least degree of atrophy, so that at the end of six weeks, when healing is perfect, the limb is quite as strong as it was to begin with. We have patients upon whom we have performed this operation in many occupations, one of them, a house painter, was able to take up his work climbing ladders and scaffolds at the end of six weeks without any difficulty.



11-29-19

## DOUBLE HARELIP AND CLEFT PALATE

*Summary:* Technic of repair—importance of conserving premaxilla—placing of sutures—method of relieving tension on sutures—concentrated tincture of benzoin for dressing.

THIS patient has the characteristics of a partially formed double harelip with wide open cleft palate. The nose is flattened down against the face on both sides and the intramandibular portion of the upper jaw protrudes (Fig. 8o *a, b*).

The first and probably the most important step in this operation must consist in the adjustment of the intramandibular portion of the upper jaw in order to secure a proper support for the lip which we are to construct. Many of the earlier operators simply cut away this portion because of the greater convenience, and this invariably left a very unsightly deformity. In order to replace this portion of the jaw a triangular segment of the vomer, which has pushed this portion forward, should be cut away. The lateral edges of this portion should be freshened and also the ends of the alveolar processes on each side, and the intervening portion should be carefully sutured so as to make a continuous alveolar process. In applying these sutures great care should be taken not to interfere with the new teeth which are being formed in the jaw. By carefully feeling with a fairly fine needle one can readily avoid these teeth, and by drawing through a fine silk suture threaded double into a fine needle, a silkworm-gut suture or silver wire suture can be threaded into the loop of the silk suture and drawn through the tissues without disturbing the teeth. We have found the application of these sutures in the following manner most satisfactory:

Pass a fine needle through the mandible on one side from front to back and then bring it forward over the intermandibular portion, and pass through the edge of this portion again from front to back, and then go to the other edge of the interman-



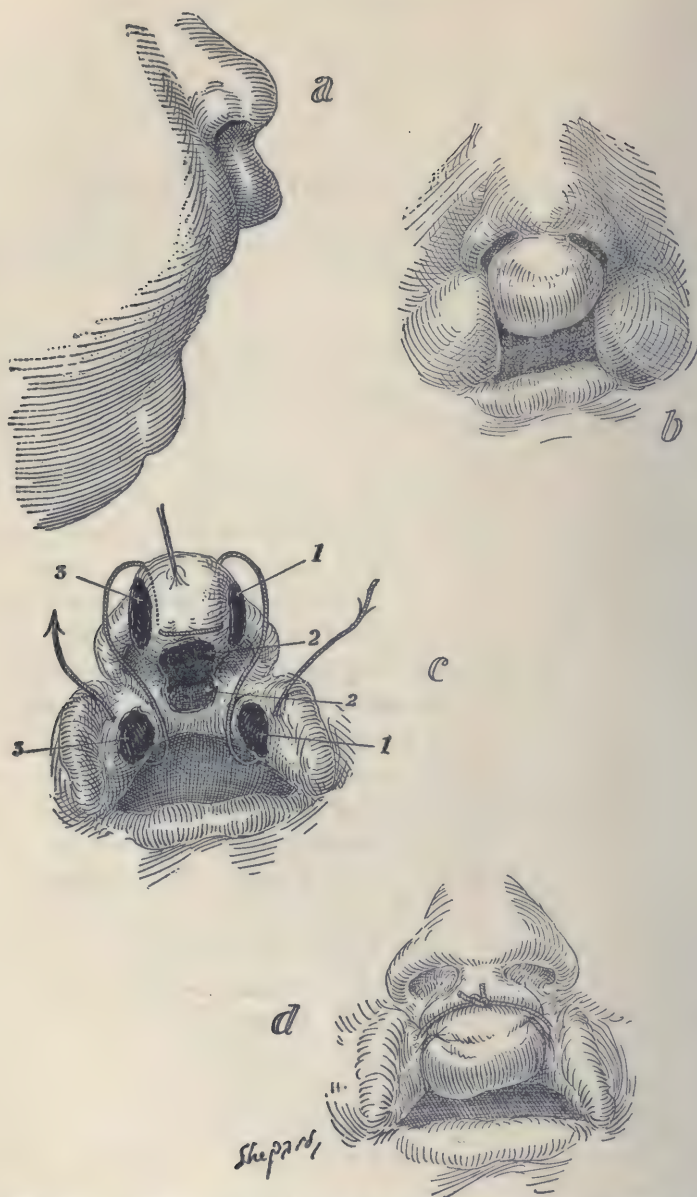


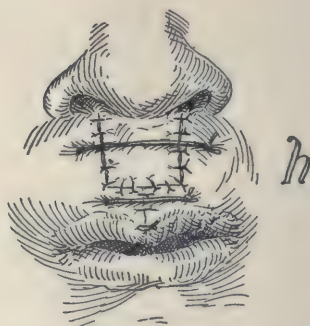
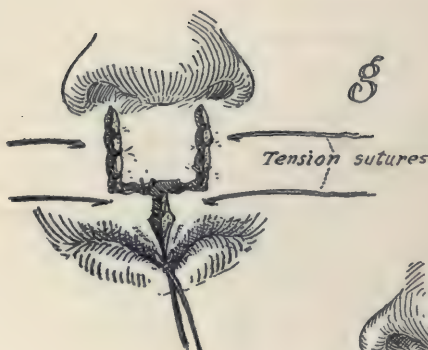
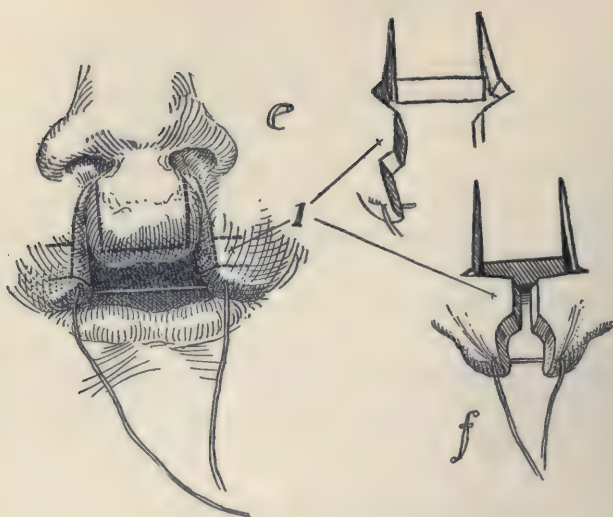
Fig. 80.—Double congenital harelip and cleft palate. First stage: *a*, Side view of child, note projecting premaxilla; *b*, front view; *c*, appearance after intermandibular portion has been freed at 2-2 and elevated; the places 1-1 and 3-3 are freshened, and a silkworm-gut suture applied as shown; *d*, result after tying of suture.

dibular portion and pass the needle from back to front. Then pass it behind the mandibular portion on the other side and pass from behind forward, and then tie the two ends. By regulating the tension upon this suture it is possible to hold this fragment in exactly the position one desires (Fig. 80, *c*, *d*).

In this case the child's strength does not seem to be sufficient to warrant a continuance of the operation because the next step involves a rather greater loss of blood than the present step, and the child is weak. Consequently, we will not complete the operation at the present time; after one or two weeks when the wounds that we have made today will have healed, the child will be able to bear the second operation.

### SECOND STAGE OF THE OPERATION

The first stage of this operation was performed nine days ago, and now the child has recuperated nicely, so that we may proceed to the closure of the harelip. The object to be attained by this part of the operation consists in producing a lip which has a reasonable thickness and proper depth, and shows the slightest possible amount of deformity because of the scars which may result from the present operation. In order to secure a sufficient amount of tissue to construct this lip without undue tension we will make use of the central portion, trimming the mucous membrane in order to make a rectangular flap (Fig. 81, *e*, *f*). We next trim the edges of the lateral portions of the cleft in such a manner as to leave the surfaces to be united entirely over the mucous membrane. In order to elevate the septum of the nose and at the same time to increase the depth of the upper lip we make a small lateral incision in the lateral flaps. The corners of the central flap will then be adjusted so that they fit into the angle formed after the lower portion of the lateral flaps have been drawn downward (Fig. 81, *f*). A suture is then applied up to the lateral projecting portion of the lip on each side, and by means of this portion the lip is lengthened and the lateral flaps are applied to the central portion, and all the surfaces are sutured in place (Fig. 81, *g*). The first silkworm-gut suture is passed through the lip and



Shepard

Fig. 81.—Second stage of operation: *e*, The dotted lines are lines of incisions; a suture has been passed through the mucocutaneous line of each side of the lip as a guide; *f*, appearance after incisions have been made; *g*, tension sutures applied and incision in mucous membrane closed with interrupted catgut sutures; *h*, result at conclusion of operation.



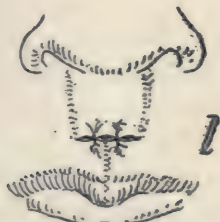
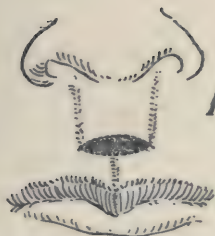
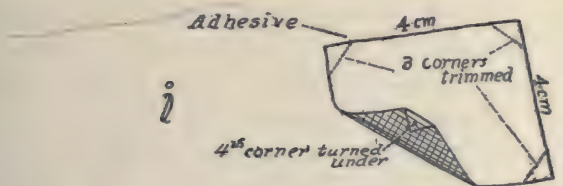


Fig. 82.—Second stage of operation: *i, j*, Method of applying adhesive plaster and silk strands in order to relieve tension on suture lines; note pad of gauze over bridge of nose to protect the skin from pressure by the strands of silk.

*k, l*, Third stage of operation: Secondary suture of small defect present on tenth day after second operation.

left untied. Then the mucous membrane is sutured posteriorly throughout with chromic catgut sutures and then the skin surfaces are sutured with horsehair. After all the suturing has been completed the silkworm-gut is tied loosely enough to prevent pressure necrosis and tightly enough to serve as a stay-suture (Fig. 81, *h*). The lateral flaps are supported by means of rubber adhesive strips 3 cm. in diameter, placed one upon the lower portion of each cheek and one upon the forehead, one each side, and these, after they have become thoroughly adherent, are approximated by means of fine silk sutures. This will remove the tension from the flaps without causing pressure on them. In order to prevent irritation from pressure of the silk sutures on the bridge of the nose it is well to insert a small piece of gauze at this point (Fig. 82, *i, j*).

### THIRD STAGE OF THE OPERATION

The second step of the operation in this case was performed twelve days ago. Two days ago when we removed the stitches it was found that there was a slight defect in the middle of the wound (Fig. 82, *k, l*). This little defect has been covered with mucous membrane from within, and in order to secure a secondary union at this point it will be necessary to remove this with a fine tenotome and then to apply two small stitches, which will undoubtedly result in perfect healing and give an ideal result.

In these cases we never apply dressings, because they are liable to accumulate mucus from the nose or from the mouth, but after drying the wound carefully we apply concentrated tincture of benzoin, which adheres to the skin and keeps the wound clean and results in healing without scar. It is also worth while to remember that if the superficial sutures are applied with a fine cambric needle without cutting edge and if the horsehair sutures are tied loosely stitch marks are avoided. A cutting needle used in applying these superficial stitches is practically certain to result in ugly stitch marks.

You can see the benefit that comes from our planning a deep lip. After the operation was complete it seemed as though our lip would be a little too deep, but now you can see that the

surplus tissue has almost all been taken up, and that when healing will be finally completed we shall have almost exactly the desirable depth of lip. In case of doubt it is always best to have too great rather than too slight a depth, because such a deformity can be more easily corrected.

The one point that should always be borne in mind in all of these cases is the nutrition of the child. When the child came to the hospital it was suffering from dysentery, and I am convinced that if we had operated at once we would have lost the baby, because the shock would have been just enough to destroy its life. Consequently, we placed the child in the care of our infant specialist, who provided a diet for it which overcame the difficulty, so that the child has gained quite a little in weight since it first came here. We had to put off the operation for about three weeks while the dysentery was being treated.

The children who are brought to the hospital from the country and are not accustomed to steam heat are likely to suffer from slight colds a day or two after reaching the hospital. If these colds are neglected or if the operation is performed while the patient is suffering from this condition, pneumonia may follow, which may destroy the patient. It is far better to permit the infant to become acclimated to the temperature of the hospital and to its surroundings before undertaking the operation.





## CLINIC OF DR. TRUMAN W. BROPHY

### ST. JOSEPH'S HOSPITAL

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#### HARELIP

*Summary:* Embryology of the jaws and lips—technic of operation for correction of harelip—necessity of plastic work on nostrils at the time lip is repaired.

*January 15, 1919.*

THIS child has what we call a partial double harelip. There is a separation of the lip in two places extending about halfway between what should be the vermilion border and the nose. There is also a complete cleft of the palate and a separation of the alveolar process on the left side. The right side is intact. While such a condition of the alveolar processes is occasionally seen, it is comparatively rare. This condition is, of course, congenital, and is due to failure on the part of the tissues to unite in the early development of the child. At the second month in a normal embryo these tissues are united. At that time or earlier, at six weeks, the tongue is of great thickness, occupying nearly all the space between the floor of the mouth and the nose. The bones which enter into the formation of the palate are developed from six centers, two from the horizontal plates of the palate bone, two from the maxillary plates of the maxillary bones, and the two premaxillary bones.

We have another child for operation in which the premaxillary bones protrude. In that case we can bring the bones back and establish a normal arch. It has been the practice among many surgeons to cut off these premaxillary bones and close the fissure in the lip, but the loss of the premaxillary bones produces a deformity which cannot be remedied. It is a great misfortune to have the premaxillary excised. It is bad surgery. The doing of this operation, the bringing of these parts into



Fig. 83.—*a*, First step in the operation consists in the removal of two wedge-shaped pieces from the floor of the nostrils to permit correction of the nasal deformity. Note the tube in angle of mouth for introduction of anesthetic into back of mouth (ether vapor delivered by a foot-pump); also small cleft in maxilla just to left of midline; *b*, *c*, incision for correction of deformity of lip; *d*, first suture. Note that minute cleft in superior maxilla has been closed by suture.



position, is absolutely necessary if we would establish a condition just as nearly anatomically normal as possible.

We will perform this operation under ether anesthesia. The first step is to close the nose so as to exclude blood when we open the lip. We must make a lip that will present a normal appearance. The nostrils, especially the left one, are wider

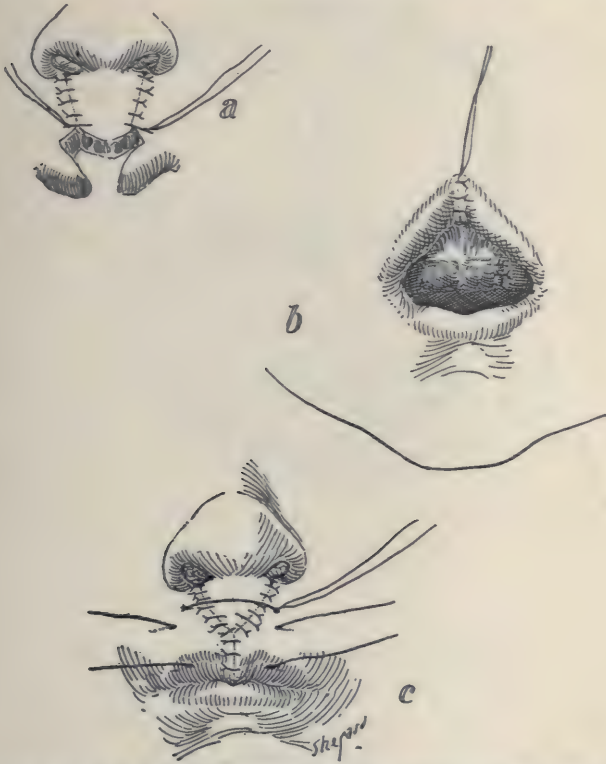


Fig. 84.—*a*, *b*, Interrupted horsehair sutures approximating skin (*a*) and mucous membrane (*b*); *c*, tension sutures of silkworm-gut.

than normal. We remove a wedge-shaped piece of tissue at the lower gap, so as to contract the nostril (Fig. 83, *a*).

Now we pick up the lip and make the flap by passing the knife obliquely upward through its entire substance (Fig. 83, *b*). We carry the knife through the substance of the lip from below upward to reach the incision that I have just made (Fig. 83, *c*).



Fig. 85.—*a, b*, Application of adhesive plaster strips to take tension off of suture lines; *c*, cardboard cuffs on arms to prevent patient from interfering at the site of operation.

This reduces the size of the abnormally dilated nostril. I hold the lip with my finger and arrest the flow of blood. We are

always careful not to permit any blood to flow until we are ready to seize the little vessel and close off the circulation.

The procedure is the same on the opposite side. We do not need to remove so wide a piece on the right side. The first consideration is always the nose, to get the nostrils right, and then close the fissure in the lip afterward. Now we have formed this nostril and will proceed to the lip. We split the tissues so as to roll out the skin a little more and make it thicker at the border. Otherwise we will have a depression in the lip. Now we will take off this superfluous mucous membrane so that the mucous membrane will not overlap the skin nor the skin overlap the mucous membrane (Fig. 83, *c*). Skin is now carefully sutured to skin, and mucous membrane to mucous membrane, using horsehair as our suture material. We have closed this gap and we have to adopt a plan to hold the parts together. We will put in one or two stay-sutures all the way across (Fig. 83, *d* and Fig. 84, *a, b, c*).

We have both these nostrils symmetric. We have a very good nose and a very good lip. We will wash out the boy's stomach so as to get rid of all the blood that has been swallowed. In doing this we avoid a temperature from the absorption of this blood in the stomach. In fact, the child would have an abnormal temperature if it had that much blood in the stomach, to say nothing of the operation.

Now we put on some strips of adhesive on the face to hold the parts together. They are very useful and very simple (Fig. 85, *a, b*). We have cuffs of cardboard on this child's arms to prevent him from putting his fists in his mouth (Fig. 85, *c*). A piece of iodoform gauze is put in the nose for the purpose of excluding secretion from the stitches for a few days—about two or three—until it seals. After we remove the gauze we clean the nose with an applicator. We have nothing here that can absorb secretion. These horsehair stitches are absolutely clean and we are not apt to have any infection.





## CLINIC OF DR. CARL BECK

### NORTH CHICAGO HOSPITAL

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#### MULTIPLE PAPILLOMATA OF THE BLADDER

*Summary:* Diagram of papilloma and cancer of bladder; operative removal of bladder papilloma—suprapubic incision and ligation of base of tumor by silk ligature—healing by granulation.

MRS. O. G., fifty-nine years old, has been suffering for many years with some disturbances of urination, but during the last four weeks very severely. The symptoms are strongly indicative of trouble in the bladder. They consist in frequent urination, painful, especially at the end, and the sensation of incomplete evacuation of the bladder, a heavy feeling, continuous dull pain, the urine at times very strongly bloody, at other times full of pus and sediment of solid material, indicates the presence of chronic cystitis. The microbic flora represents an enormous number of pathogenic and non-pathogenic germs, although none of the specific tubercular germs are to be found. Cystoscopic examination is impossible, the catheterization even is very painful, and the catheter strikes a body which prevents the catheter entering the bladder proper. Bimanual palpation through vagina and abdominal wall shows that the bladder contains a large irregular mass, not particularly sensitive, not very hard, somewhat movable. In general, the patient does not suffer very much. She has lost some weight, but not to such an extent that one could say that she is cachectic. Summing up these symptoms, the diagnosis is between papilloma, stones, and carcinoma of the bladder.

In favor of the stones are some of the subjective symptoms, like the shutting off of urine sometimes suddenly toward the end of micturition, but this symptom has been so rare that one could also attribute it to the effect of a very movable papilloma.

Against a carcinoma speaks the absence of cachexia, although it is well known that with a carcinoma of the bladder the patient's strength may often be preserved for a long time before the disease really seriously affects the health. The preponderance of evidence therefore is in favor of papilloma, although carcinoma is not excluded. An exploration is the only means of diagnosis and possible cure. This exploration is performed, as you see, in the usual manner. With the patient in the Trendelenburg position I make my incision and open the bladder. As soon as the bladder is emptied we see a very interesting picture. Clustered like the heads of several cauliflowers on the front wall of the bladder are numerous projections, rounded, of the size of a large walnut, and two of them close to the bottom, near the trigonum, overlapping the urethral opening. They look like a large prostate, the tumors are grayish in appearance, owing to the deposit of some phosphatic material within the meshes of projecting, floating, papillary excrescences, somewhat of the appearance of a decaying strawberry, also similar in color. They are hard on their bottom and broadly sitting upon the mucous membrane, with no pedicle, but they are freely movable. They are raised out of the bladder as far as possible, with their body, and the bladder mucosa is incised within its normal structure down to the submucosa, then a long silk thread is passed through their bottom and the papillomata are ligated off with this silk thread *en masse*, whereupon the silk thread is left long enough to hang out of the bladder. The bleeding during this procedure is comparatively slight, altogether four such mass-ligatures are applied, leaving the bladder clean from papilloma, with four stumps of ligated submucosa, three in front and one at the bottom.

The bladder is then washed out thoroughly and without any drainage from above, except such as is furnished by the ends of the ligatures hanging out. A catheter is placed into the urethra, the wound above is not sutured at all, but left wide open (Fig. 86).

This patient made a very good, although slow, recovery. There was no fever and no infection. The only disagreeable



feature of the after-treatment was the tremendous amount of phosphate deposited on the threads and on the abdominal wall, which transformed the wound into that characteristic of phosphate-crust wound, which is so well known to the surgeon operating on such bladders.

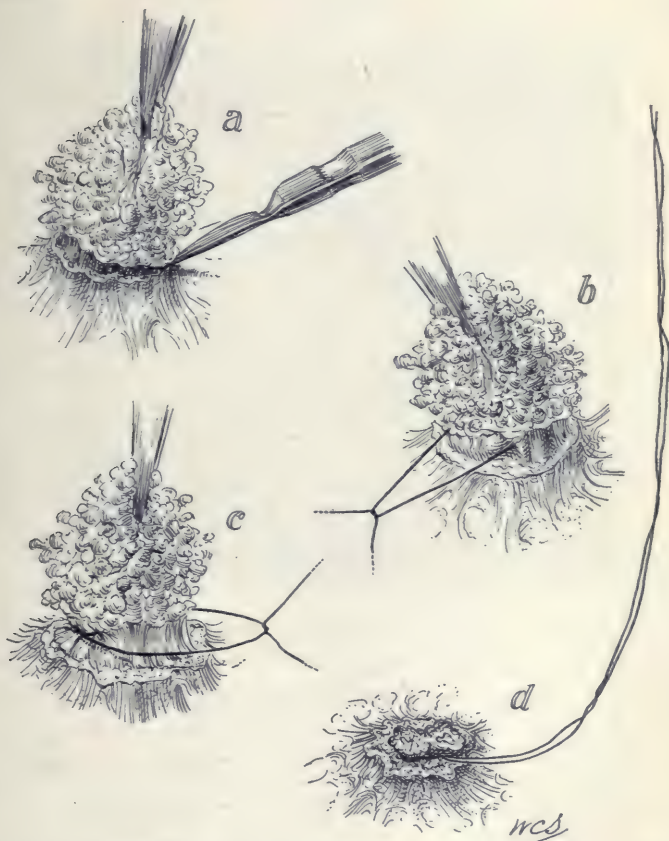


Fig. 86.—Papillomata of the bladder: *a*, Mucosa incised; *b*, *c*, base of papilloma transfixated and ligated; *d*, papilloma excised. Ligature left long enough to reach out of bladder.

Finally, by giving large quantities of lithiated water and fruit juices and carbonated waters, particularly large quantities of fluid, the patient improved so that secondary suture of the bladder could be made, but not before the large sloughs with

the sutures had yielded, leaving nice granulating wounds in the bladder. These granulomatous ulcers, three months after the operation, have been greatly reduced in size, two of them are scars already, one of them is somewhat projecting, but yields very well to cauterization with nitrate of silver. The patient is gaining and is free from symptoms, but still has a tendency



Fig. 87.—Papillomata after removal and immersion in Kayserling's solution.

to form small calculi of phosphates, which are washed out occasionally.

Figure 87 shows the appearance of the specimens after they had been in Kayserling's solution for some time; therefore they are somewhat shrivelled. When they were fresh they gave that beautiful picture in the latter which is so familiar to us, resembling that sea-animal of the Medusa type, with transparent, large, floating excrescences.

## SYPHILIS OF THE STOMACH—RESECTION OF PYLORUS FOR IMPERMEABLE LUETIC STRICTURE

*Summary:* A patient presenting symptoms of total pyloric obstruction, with marked emaciation and a palpable mass; operation—the diagnosis—frequency of gastric lues.

MR. S., fifty-one years old. Single. Referred to me by Dr. E., in whose employ he has been for many years, and who has known him since he was a young boy. This fact is mentioned because Dr. E., a good observer, has never noticed any abnormal conditions which would lead him to suspect any kind of ailment of syphilitic nature.

When S. came under our care he was brought with the diagnosis of ulcer of the stomach by Dr. E., most likely carcinomatous, with a subsequent enlargement of the stomach, emaciation, and all the symptoms which are so characteristic of cancer. He would eat a certain amount of food and it would stay in his stomach for twenty-four hours, or even longer, and then he would vomit it up, showing that not a particle of it, except perhaps a little liquid, had seeped through the pylorus or had been absorbed from the stomach wall. Sometimes he would vomit it up at once and sometimes he could carry it for a day. Of course, it would cause great inconvenience if left in the stomach for such a long time—cramps and even violent pains—but this would occur rarely. He was so emaciated that one could see through the abdominal wall the tremendous stomach, reaching down almost to his symphysis when he was standing, and, being very tall, this man had an enormous enlargement. There were no other symptoms from any other organ or group of organs, nor were there any pathologic findings. At the first taking of the history even the history of a specific infection was denied—not by intention, but because the man really did not think that he had an infection. The question being asked, Have you ever had syphilitic infection? he answered in the negative.



The examination of his stomach showed retention of all the food, a great deal of mucus, but absence of any pathologic cells indicating carcinoma, and also absence of free HCl and a great deal of free butyric acid. The roentgenographic examination showed that hardly any barium passed the stomach for twenty-four hours. After that time a few barium shadows would appear in the small intestine, but even after forty-eight hours most of the barium was still in the stomach.

There was no distinct filling defect, although the pylorus seemed to be indicated in the picture by a pointed horn-like end, in a place where one could feel a distinct tumor by palpation. This tumor was freely movable in the abdomen within a radius of 2 inches. Clinical diagnosis, therefore, was made of a cicatrical stricture of the pylorus, with subsequent hyperplasia, hypertrophy, and distention of the stomach—starvation of the patient.

An operation was proposed and performed. The idea was to make a gastro-enterostomy. When the abdomen was opened a most peculiar picture offered itself: the liver was covered with a greenish-yellow scum, and on some portions one could distinctly see scars, evidently due to some chronic inflammatory process. The scum on the liver could not be removed; it was intimately connected and was not an exudate, but rather post-inflammatory residue—regular scar; the liver seemed rather smaller than normal, but the picture was entirely different from a chronic cirrhosis of the liver due to alcohol.

Trying to pass my finger through the pylorus, testing it for its permeability, I found that the tumor was due to chronic induration and cicatrization of the prepyloric region to the extent of about  $1\frac{1}{2}$  inches, and that it did not admit into the lumen the point of my little finger. I decided to remove the tumor mass and the whole pylorus and join the stomach again to the duodenum. Temporary compression some distance away from the proposed line of resection was made, and the tumor dissected by straight lines of incision from the stomach. The wound in the stomach is diminished by suturing the mucosa muscularis and peritoneum down to the size of the lumen of the

duodenum, whereupon the two openings of the stomach and the duodenum were joined by straight anastomosis, suturing peritoneum, muscularis, and mucosa, first in the back and then in the front. After this union of stomach and duodenum was completed and gastro-enterostomy posteriorly between stomach and jejunum was made, the abdomen was closed.

The patient made an absolutely uneventful recovery. He was fed from the third day with liquids, from the eighth day with solids, gained very rapidly in weight, and is now well and able to work again.

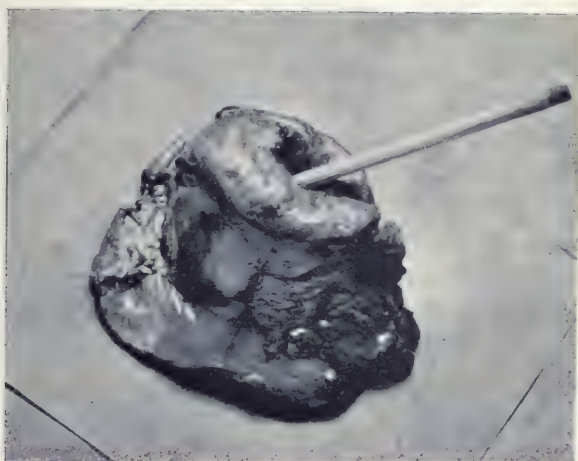


Fig. 88.—Excised syphilitic scar; an attempt has been made to pass a match through the gastric lumen at point of cicatrix, but without success.

No trace of carcinoma or glandular infection was found during the operation, but the specimen removed showed distinct results of chronic inflammatory changes, as they are characterized in syphilis (Fig. 88). Going into the taking of the history again, we find now that at the age of twenty this man had a distinct lesion, an ulcer, which was treated with quick-silver inunctions and K. I. for some time; that it had healed without further symptoms.

The microscopic changes of the specimen show typical scars from syphilis.

The syphilitic lesions of the stomach are by no means as rare as we would suppose. Comparing my own experiences with those of other surgeons, I must say that I have found many more cases of this affection than others in my operative work, and I suspect that some of my early cases, in which I diagnosed carcinoma and which have afterward remained free from symptoms for years, although I have not made a radical operation but a palliative gastro-enterostomy, have been such syphilitic obstructions, acutely inflamed and indurated, so extensive as to make me believe we had to deal with an inoperable carcinoma. Some of these cases I have diagnosed as syphilis during the operation. One of them is so characteristic that I will mention in a few words its history, particularly since one of the best diagnosticians whom I ever met, the late Prof. Christian Fenger, had diagnosed that particular case as carcinoma and refused to operate. It was the case of a young woman twenty-eight years old, rather thin and emaciated, with a tumor of the stomach and a large number of irregular tumors of the liver, which Fenger took for metastatic carcinoma nodules in the liver. The age of the patient (who afterward consulted me, and who had been told by Fenger that she had no more than a month or two to live) induced me to make an exploration, and, lo and behold! I found the liver studded with typical gummata, from the size of a hazelnut to a walnut, and the stomach the seat of a tumor looking like carcinoma, also other growths elsewhere of the same nature. A very strong antisyphilitic treatment cured the patient fully of her ailment.

Of course, no antisyphilitic treatment will be able to cure a cicatricial contraction of the pylorus; it will remain an obstruction; the scar is the cure of the process, as far as the syphilitic nature is concerned; the operation is the cure of the mechanical obstacle to digestion. In a large number of cases of explorations of the stomach we are bound to meet with instances of mechanical obstruction, inflammatory growth in the intestinal tract, particularly in the stomach, of syphilitic nature. Formerly we were convinced that tuberculosis and syphilis are extremely rare in the stomach, but in the last few years accounts



of these pathologic changes are coming in greater numbers, and it is even possible to make a diagnosis beforehand if the history of the syphilitic infection is manifest or pointed out by the patient. There is a possibility of carcinoma being developed on the basis of a syphilitic ulcer, as we see also elsewhere in the anatomy, for instance, carcinoma of the tongue on the base of a syphilitic granulation, or a carcinoma of the penis on the base of syphilitic ulcer, carcinoma of the uterus, carcinoma of the leg, on a base of a varicose specific ulcer. These pathologic combinations have to be considered when we deal with an instance of this kind. I also have had experiences of this class within the stomach, and one of these cases has been reported by one of my associates in a lengthy article on syphilis of the stomach as observed in the Roentgen laboratory.



## RESTORATION OF CHEEK FOLLOWING EXTENSIVE RESECTION FOR CARCINOMA

*Summary:* Excision of entire thickness of cheek for carcinoma; technic for repair of resulting defect—inversion of pedicled flap of skin to replace mucous membrane.

MR. A. F., farmer, sent to me by Dr. Ch., who has had the patient under observation for some time. A tumor is visible on the right side of the face below the eye and in front of the ear, which looks as if it were very superficial, but on close examination it is found that this tumor is situated very deep and is also protruding to a certain extent into the mouth cavity, corresponding to the same region. In the mouth the protruding tumor is ulcerated and the ulcer which is situated between the last teeth and somewhat in front of the last lower teeth is covered with a greenish necrotic area. The jaws are hindered in their movements by these growths to such an extent that the patient cannot close his jaw firmly, nor can he open it more than about an inch between his front teeth. The diagnosis, confirmed by microscopic analysis, does not offer any difficulties. It is a carcinoma in one of those localities in which we find it not frequently, but occasionally. I have observed quite a large number of such carcinomata.

This case seems to be local as yet. At least no gland of the group which is supplied by lymph from this locality, namely, the posterior submaxillary glands, seems to be affected. On closer examination we come to the conclusion that the carcinoma is not very large in extent and that the swelling which we notice is not carcinoma, but reactive inflammation caused by the small carcinoma infiltrating the tissues around it—something that we observe also elsewhere as the result of a slow carcinomatous growth. It is an experience which we frequently note that certain kinds of epitheliomatous tumors act like a foreign body and produce considerable reaction around the growth, so that the tumor appears much larger and often leads to the



detection of an initial, still localized growth. This is very favorable, and I think that it gives us a chance for a radical cure in this particular case. We therefore have decided to excise the tumor *in toto*, with allowance of considerable resection of normal mucous membrane around the tumor, removing at the same time all the infiltrated tissue, and then replace mucous membrane by skin, a process which we have repeatedly tried with good success.

The operation is performed in the following manner: An incision starting from the outer angle of the ear, crossing the

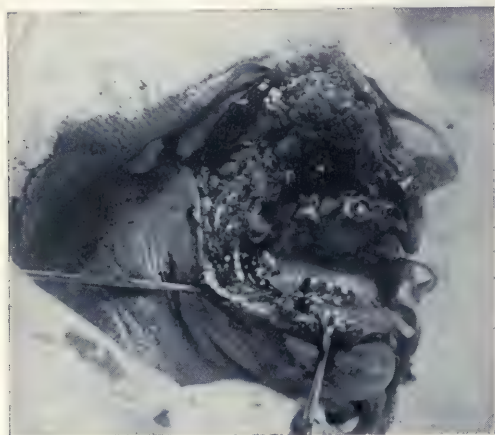


Fig. 89.—Defect in side of face following resection of carcinoma-bearing tissues.

height of the tumor, directly into the angle of the mouth; the tumor is now exposed, and by dissection freed on all sides, keeping the knife as much as possible in uninfiltreated tissue and ligating all the vessels as they appear. The duct of Steno shows itself infiltrated and drawn into the area of the tissue, although it is not obstructed. It is taken along. When we reach the mucous membrane we find that we can open the jaw very freely now, and we excise the carcinoma, taking along about  $\frac{1}{4}$  to  $\frac{1}{2}$  inch of normal mucosa with it. That leaves a defect of about the size of a half-dollar in the mucous membrane of the mouth (Fig. 89). The duct from the parotid is within

the wound. A flap is formed now of the shape of a tongue, with its base toward the ear, receiving its circulation from that side. In its posterior portion it is within the bearded area of the cheek; this flap is turned inward, doubled on itself, and the tip is sutured accurately into the angle of the mucosa between the two jaws; the sides of the flap are sutured into the mucosa above and below as far as possible (Fig. 90). In front, near the angle of the mouth, mucosa is sutured to mucosa, and skin to skin. This leaves a hole in the cheek of a half-moon shape,



Fig. 90.—Pedicled flap from chin turned inward and tip sutured to mucous membrane at posterior angle of incision.

the smaller side of the half-moon being formed by the skin-flap, the larger side of the same formed by the wound of the cheek (Figs. 91, 92). The saliva runs into the mouth, since the opening of the duct is in the flap and directed downward toward the groove of the lower jaw.

The patient recovered from this operation with primary union and was left in this condition for two weeks until firm union had taken place. Then an attempt was made to close the hole. The tongue-shaped flap was cut at its base, but not clear down through all the tissues, and the flap turned with its skin surface toward the mouth, and sutured with its half-

moon surface into the freshened wound in the cheek mucosa. It is true that an accurate suture could not be made, the mouth

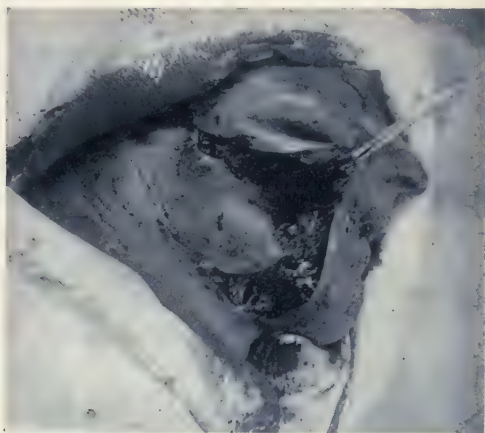


Fig. 91.—Anterior portion of incision (at angle of mouth) closed by approximating skin to skin and mucous membrane to mucous membrane.

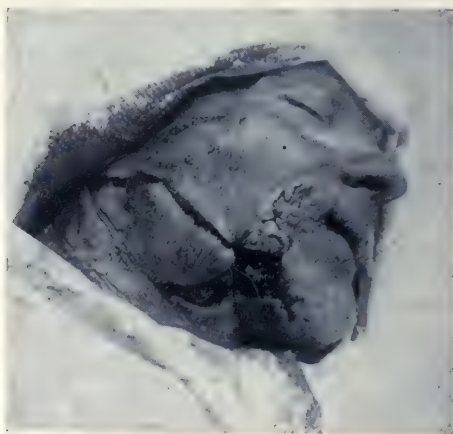


Fig. 92.—Condition at conclusion of first operation.

did not allow a wide opening, and the operation had to be performed under local anesthesia; only two stitches were placed in mucosa and skin and the adaptation was necessarily poor.



It was not expected to have primary union, but only to diminish the aperture in the cheek, so that only a small opening remained, which could be closed to much better advantage some months later when the union of the cheek inside was firmer. After a week the patient had healed so far that only a very small opening in a depression on his cheek remained, through which no saliva dripped, but through which air could be pressed, and some food, liquid especially, occasionally escaped. In the meantime

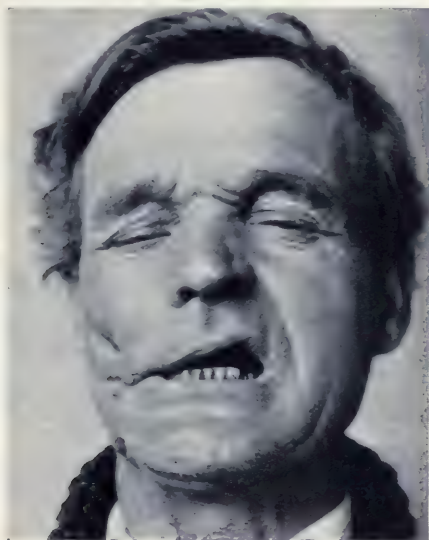


Fig. 93.—After second operation mouth can be opened spontaneously about  $\frac{1}{2}$  inch.

the skin-flap in the mouth had healed firmly, the hair had grown to about  $\frac{1}{4}$  inch in length and was falling out spontaneously; the skin was already somewhat rosy and the hair follicles showed distinctly as black spots in the rosy surface. The mouth could not be opened spontaneously more than about  $\frac{1}{4}$  inch (Fig. 93), but with the aid of a Heister speculum, such as is used to pry open the jaws during anesthesia, the patient was treated twice daily, and within a few weeks could open his mouth spontaneously about 1 or  $1\frac{1}{4}$  inches.

Today, several months after the operation just described, we find that there is a very small opening in the cheek through which only air passes, and a little irregular depression about this opening (Fig. 94). We close the fistula and fill in the depression in the following way:



Fig. 94.—Just preceding last (third) operation. Note depression in cheek with fistula at its center, which were both obliterated by a single plastic procedure.

Sharp incisions are made into the border of the depression; the skin within the same is fully resected and the border flared outwardly by sutures so as to make an elevation at this spot instead of a depression. This elevation must be a so exaggerated one because gradually it will give way to a falling in, which will probably remain even with the rest of the cheek, if it has been made prominent enough in the first place.

## CLINIC OF DR. CARL B. DAVIS

### PRESBYTERIAN HOSPITAL

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#### PLASTIC REPAIR OF THE DELTOID MUSCLE

*Summary:* Detachment of deltoid muscle from its bony origin following treatment of infected compound fracture of clavicle, with complete loss of ability to abduct arm—treatment by fat-fascia transplantation; result after ten weeks.

THIS patient, a man of thirty, developed an osteomyelitis of the right clavicle following a compound fracture. The bone was cureted a time or two, and this, with a considerable amount of suppuration of the soft parts, resulted in a detachment of the greater part of the deltoid from its bony origin.

On admission to our service one year after the accident, and about three months after the wound had closed, the patient showed two parallel scars, one over the clavicle and one  $\frac{1}{2}$  inch lower. He was unable to abduct the right arm. The actions of the latissimus dorsi, biceps, pectoralis, and other muscles attached to the humerus were normal. The sensation in the skin of the arm in the region supplied by the circumflex nerve was normal. *x*-Ray plates showed a deformed clavicle. The extremity was normal in other respects except for a slight flattening of the tip of the shoulder.

An incision was made 1 inch below the clavicle, extending from the tip of the acromion process to the middle of the clavicle. The skin was dissected upward from over the posterior triangle of the neck until the trapezius was exposed. A second incision at right angles to the first was carried downward over the shoulder and the skin turned back until the deltoid was found contracted down toward its attachment to the humerus. Traction on the deltoid failed to bring the muscle to the height of the clavicle. A flap of fascia to which a thick layer of subcutaneous fat was adherent was taken from the thigh and placed in the





Fig. 95.—The lesion was exposed through a T-shaped incision and the gap between the deltoid muscle and its normal origin bridged by the implantation of a piece of fascia from the thigh.

wound with the fat layer down to prevent the flap becoming adherent to the capsule. The flap was attached by chromic gut to the trapezius and clavicle. The arm was brought out to a right angle with the trunk, and the deltoid was sutured as far up on the flap as possible. The skin was then closed in the usual manner (Fig. 95). A triangle splint was adjusted, and the arm, splint, and chest were enclosed in a plaster-of-Paris cast.



Fig. 96.—Ten weeks after operation. Patient can abduct arm and hold it at right angles with the body.

This was kept in place six weeks. On removal of the cast the patient was encouraged to abduct the arm slowly at first and later with all possible vigor. Later he was put through rather vigorous wand exercises.

It is ten weeks since the operation, and the man is about to go to his home. As you see, he is now able to hold the arm in a horizontal position (Fig. 96).





## RECURRENT DISLOCATION OF THE PATELLA

*Summary:* History of case presented; technic of operative treatment; pathology of dislocation of patella.

THE patient, a young woman of twenty-four, slipped during a basket ball game three years ago and fell to the floor. She was unable to use the knee until the patella, which was lying external to the supracondylar ridge, had been replaced in its normal position. The dislocation has been increasing in frequency until the present time, when there is almost daily a sudden giving away of the knee, and the patient drops to the floor or street without warning.

There is no pain in the joint except at the time when the patella slips out over the ridge. Formerly there was some swelling of the joint following dislocation, but recently there is no after-disturbance. There is no muscular trouble and no other deformity. The x-ray examination of the joint is negative.

There are various operative methods of holding the patella within normal bounds. Some are very complicated and involve opening of the joint cavity. Some of the more simple methods have been quite efficient. In this case a curved incision (Fig. 97) was used to expose the patella and its tendinous attachments. The quadriceps tendon was drawn inward and attached to the medial portion of the sheath of the vastus internus muscle. The medial portion of the capsule of the joint was plicated. The patellar tendon was split upward from its tibial attachment, and the external or lateral half cut loose from its bony attachment and turned inward at a right angle across the remaining attached portion and sutured to the periosteum of the tibia. The skin was closed without drainage, and a plaster cast adjusted. The joint was kept fixed for two weeks and then passive flexion for several days, and later cautious active flexion of the joint to 50 per cent. of function. The patient left the hospital three weeks after operation—using crutches for one week and a cane

for a succeeding week. There has been no subsequent dislocation and the patient has free use of the joint.

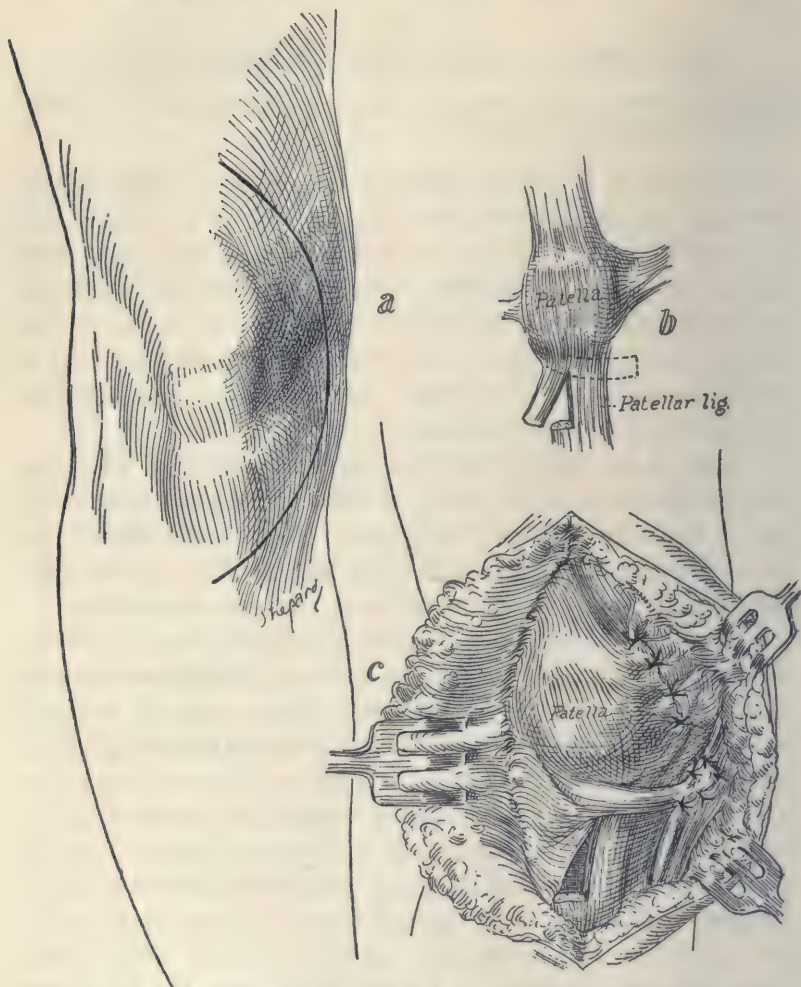


Fig. 97.—*a*, Curved incision giving free approach to field of operation; *b*, patellar ligament split preparatory to transplantation of the insertion of its lateral half; *c*, wound ready for closure. Note transplanted portion of patellar tendon and plication of medial portion of capsule of knee-joint.

The dislocation of the patella is most frequently toward the outer side. According to one writer this is due to the fact that

the patella catches on the outer condyloid ridge and is then grooved over the ridge instead of into the trochlea or facies patellaris. There would seem to be some anatomic grounds for this in the fact that the outer portion of the trochlea is more prominent and extends higher than the inner portion. Dislocation of the patella is more common in women. But two cases of this kind have come to our attention, and both of these were in women. In both women the inward inclination of the femur, normally greater in the female than the male, was somewhat exaggerated, giving a suggestion of genu valgum. Thus with the trochlear surface extending higher and more prominently on its lateral portion—a supracondylar ridge extending higher—we can conceive of a more ready displacement laterally, and with the greater inward femoral inclination a greater frequency in woman than in man.

Any method of fixation should aim to start the patella into the groove where it will continue its course. Hence a small force exerted high on the quadriceps tendon is quite as valuable as a more vigorous force exerted on the patella midway in its descent in the trochlea.





## CLINIC OF DR. THOMAS J. WATKINS

ST. LUKE'S HOSPITAL

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### A PLASTIC OPERATION FOR CONSTRICTION AT THE VAGINAL ORIFICE AND FOR VAGINISMUS

CONSTRICTION at the vaginal orifice is not a rare condition to encounter. Usually the treatment has not been very satisfactory. I employ a modified plastic procedure which Emmet devised for the relief of constrictions occurring in extensive vesicovaginal fistulæ. The operation is also a modification of the procedure practised by T. Gaylord Thomas for cure of constriction at the vaginal orifice.

#### TECHNIC

A median incision is made, as shown in Fig. 98, *a*, *b*, which should be long and deep enough to relieve all the constriction. *Care should be taken that no firm connective-tissue fibers remain between the incision and the rectal wall.* Cutting through all this fibrous tissue means almost certainty of success in the relief of the condition and also permits satisfactory suture of the wound, which could not otherwise be accomplished. The first suture is placed as shown in Fig. 98, *c*, and approximates the two ends of the incision. It is placed underneath the skin and mucous membrane. Two or three sutures are placed laterally, which completes the closure of the wound, and if accurately placed there is little or no raw surface left uncovered (Figs. 98, *d*, 99). The following case illustrates the use of the operation and its application:

Mrs. D., aged twenty-four, consulted me after she had been married six months. Her complaint was dyspareunia, profuse vaginal discharge with much irritation, and sterility. There was no history of any venereal infection.





Examination revealed a profuse mucopurulent discharge with much redness of the vulva and vagina. Microscopic examination of the secretion showed an absence of gonococcus and an abundance of vaginal bacteria.

The operation described was performed with entire relief of the discharge and of the dyspareunia, and pregnancy took place some two or three months later.

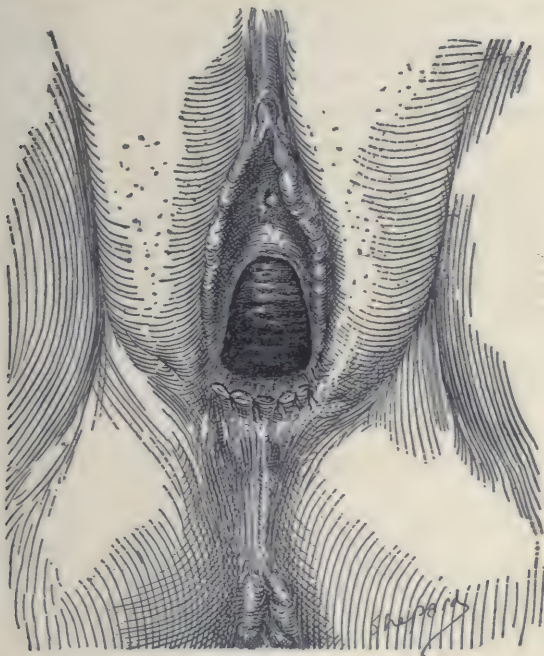


Fig. 99.—Constriction of vaginal orifice. Operation completed.

I happened to encounter a number of these cases in the last two or three years where the above-described operation has given such satisfactory results as to induce me to present the subject today. A review of Emmet's work shows that he incised the connective-tissue bands for the relief of constrict-

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Fig. 98.—Constriction of vaginal orifice relieved by plastic operation: *a, b*, Location and depth of incision necessary to insure a successful result; *c*, insertion of first stitch; this stitch approximates the ends of the incision; *d*, closure completed by a few interrupted sutures.

tions in extensive cases of vesicovaginal fistulæ. He observed that if these were incised the incision finally became circular. He later introduced sutures at the time of incision, placing the sutures parallel to the line of excision. This same procedure was apparently independently developed many years later for the relief of stenosis at the pylorus of the stomach.

T. Gaylord Thomas treated this condition by making a deep longitudinal median incision and requiring the patient to wear a large Sims glass vaginal dilator for some weeks. He obtained excellent results, but the treatment was painful to the patient, and the wound, which had to heal by granulation, persisted for a long time. The reports of other cases which I have treated for this condition are not necessary because they contain no features of additional interest. As far as my experience has extended I feel quite certain that this operation would also relieve all the cases of dyspareunia due to vaginismus.

## CARCINOMA OF THE CERVIX TREATED BY RADIUM AND HYSTERECTOMY

MRS. T., aged fifty-three, always well and strong until present illness. Menopause one and a half years ago. For one year has noticed a watery discharge at times, occasionally streaked with blood, but without odor.

Examination revealed a carcinoma of the cervix making the cervix so large that it nearly filled the pelvis. The vaginal walls, however, were very little involved. Rectal examination revealed no induration in the broad ligaments.

*Diagnosis.*—Carcinoma of the cervix.

The treatment decided upon was to use radium, to be followed by hysterectomy and the postoperative use of radium. To illustrate the extensive involvement of the tissues I refer to the fact that two of our best surgeons had decided the case inoperable.

On May 19, 1917, 50 milligrams of radium were inserted and sutured in the cervical canal. This was left in twenty-four hours. A section of the cervix, taken for diagnostic purposes, was proved to be a cancer. Three days later a complete hysterectomy was made. Cuffs of the vaginal walls were made and sutured over the cervix, and the operation completed through an abdominal incision.

Recovery was uneventful except for excessive vomiting during the second week after the operation. There has been no evidence of any carcinoma about the stomach.

Examination was made July 27, 1917, and a small nodule was found in the vault of the vagina. It was impossible to say whether this was carcinoma or scar tissue. There was no erosion. Rectal examination gave the same findings.

On July 31, 1917, 50 milligrams of radium were placed in the vagina for twelve hours. This was repeated on September 24, 1918, and on December 23, 1918.



## COMMENTS

There has been no ulcerative area at any time since the operation. She still has a small mass at the former site of the cervix. This is now possibly 2 inches long and  $\frac{1}{2}$  to 1 inch in the other diameters. The probabilities are that it is a carcinoma, and will ultimately become progressive. The patient has had no pain and there is no loss in weight.

The object in reporting this case is to show the good results obtained with radium and operation in bad cases, and also to call attention to the use of radium before rather than immediately after operation for carcinoma. The interval between the use of radium and the operation is important. Numerous observations are recorded relative to the difficulty of the operation when considerable time intervenes between the radium application and the operation, due to the production of an extensive amount of connective tissue. This is so marked that some authors advise not operating after the use of radium. We believe that if the operation is done after radium is used the interval should not be long enough for much connective-tissue formation to take place. It is likely safe, however, to have an interval of one month. The reason for not waiting in this case was the apparent rapid growth and for the mental effect upon the patient. From what we have observed in practice and gleaned from the literature we believe that there is danger in using an excessive amount of radium; that an excessive amount of radium lessens the resistance of the tissues and produces a rapid growth of the carcinoma. In a case like this one treatment of 50 milligrams for twelve hours every two or three months should be considered the maximum dose. This case is an example of the great value of palliative remedies in the treatment of extensive cancer.

## CLINIC OF DR. ARTHUR DEAN BEVAN

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#### APPENDICITIS

*Summary:* Historical review—the Ochsner treatment—advantages of operation in every acute case when the patient is a good surgical risk; pathology of appendicitis—routes of infection—importance of local irritation of appendical mucosa; diagnosis—three symptoms: pain, tenderness, and rigidity; recurring appendicitis—cases of so-called chronic appendicitis without acute symptoms usually examples of mistaken diagnoses—fallacy of x-ray evidence; technic of appendectomy.

Complications of appendicitis: (a) abscess—locations—when to operate—general management—rupture into bladder—subphrenic abscess; (b) liver infection—abscess and portal thrombophlebitis; (c) general peritonitis—early diagnosis imperative—surgical treatment—anesthesia—incision—disposal of focus of infection—determination of extent of disease—irrigation of peritoneal cavity—drainage—dressings—after-treatment.

I WANT to present to you this morning 2 cases which we have clinically diagnosed as appendicitis, and to take the opportunity, with these examples before us, to discuss pretty fully the ordinary clinical side of appendicitis. While the first case is being prepared and anesthetized for operation I will review briefly with you the history of appendicitis as we today recognize it, and the development of the surgical therapy for its relief.

I graduated in medicine in 1883, and up to that time the term "appendicitis" was practically not known in medical literature. The clinicians of that period, both the internists and the surgeons, recognized a condition of perityphlitis, an inflammation about the ileocecal region resulting frequently in the development of a hard, inflammatory induration in the right lower quadrant of the abdomen, which in the majority of cases disappeared without operation, but which formed in the minor-

ity of the cases an abscess which had to be opened and drained. The general conception was that the condition was due to an impaction of feces in the cecum with resulting inflammation.

It was not until 1885, when Reginald Fitz, a pathologist and later professor of internal medicine at Harvard University, presented his classical paper on appendicitis on the basis largely of deadhouse evidence, that we began to realize the true pathology of the condition and learned that in almost all of these cases the appendix was the focus of the inflammatory process, and it was not until 1889 that McBurney first attacked one of these cases surgically in its early development and removed the inflamed appendix before the process had extended beyond the appendix or had produced a localized abscess. I think we can very properly give Reginald Fitz the credit of establishing the etiology of the condition, and McBurney the credit for the pioneer work in the modern surgical therapy which has since that time been so generally adopted.

I can probably present this subject in a clearer way to you if I relate my own personal experience, as I lived through that developmental period of this work. In the first years that I was in practice from 1883 to 1889, the year of McBurney's first operation, I operated upon a number of cases of appendicitis which, however, we regarded then as perityphlitis, and did what was then the recognized surgical procedure. This was known as the Willard Parker incision. The Willard Parker incision was made parallel with Poupart's ligament and about 1 inch above; it divided the skin and superficial fascia, the external oblique and internal oblique and transversalis muscles, and came down to the peritoneum. Then, instead of opening the peritoneum as we do now in appendicitis operations, the peritoneum was carefully lifted up from the iliac fossa until the surgeon's finger opened into the abscess in what we regarded as an extraperitoneal position, which, of course, was not a fact, but in such a way as to prevent opening the general peritoneal cavity. A drainage-tube was then introduced, and the patient usually went on to a good recovery. Sometimes a fecal concretion would be washed out of the ab-



cess cavity during the after-treatment, or a sloughing mass, which might be the appendix itself. Frequently a fecal fistula would form and persist for ten days to two weeks, but these usually went on to closure without necessitating a second operation.

After Fitz's article, but especially after McBurney's first contribution, we at once here in America followed McBurney's example and attacked a number of these cases early with the intention of preventing, by removal of the appendix, abscess formation. In carrying out this work, however, we met with a great deal of opposition, especially from the medical men and also from a certain class of surgeons. From 1889 until 1900 a very heated debate went on here in America, and from America extended all over the world, in regard to the advisability of operating in the early stages of appendicitis, and the advocates of early radical surgery were very severely criticized. Naturally during this debate a great deal of evidence was submitted by both sides. In this decade at almost every meeting of the Surgical Section of the American Medical Association and of the American Surgical Association the subject of appendicitis and its treatment was discussed pro and con. The medical men and the conservative surgeons pointed to the fact that about 85 per cent. of these cases went on to recovery without abscess formation, and many of them took the position that only such as developed abscess should be operated upon. In the early history of the work many cases were operated upon on the third or fourth day or later when the patients were in desperate condition, many of them with well-developed peritonitis, and the mortality was very high. Gradually, however, as the evidence accumulated it became clear that if the cases were operated upon within the first twenty-four hours of the onset and the appendix removed, that the operation was very safe and gave a low mortality, not to exceed 2 or 3 per cent., and this prompt surgery with removal of the appendix had the additional feature of relieving the patient permanently of the disease, whereas the medical management was associated with a much larger mortality and had the disadvantage that in

a large proportion of the cases the patient had subsequent attacks.

In spite of the bitter attacks made on the advocates of the early radical operation, the evidence soon accumulated, demonstrating beyond question the correctness of their views, and this evidence has been accumulating ever since up to the present time, until we can now say that a case operated on within the first twenty-four hours of the onset, with good technic, carries less than 2 per cent. risk to the individual. If not operated upon, the immediate risk is certainly four or five times as great, and there is an additional risk of serious complications, such as peritonitis, subphrenic abscess, recurring attacks, and permanent disability of the intestinal tract from adhesions, etc.

Clear as these facts appear to us today, those of you who did not live through the period cannot realize what a difficult struggle it was to convince the medical profession and the public of the greater safety of prompt, early radical operation for the relief of the condition.

During its development period Sahli, of Switzerland, formulated the most rational form of medical management that was ever presented to the profession. Sahli's conception was, briefly, this: That a patient attacked with appendicitis should be placed absolutely at rest, the intestinal tract should be placed absolutely at rest with opium, the vomiting and nausea which were such frequent accompaniments of the condition should be relieved by washing out the stomach, no cathartics should be given, and the patient should be given liquids and foods by rectum, the whole purpose of the treatment being to produce absolute rest of the individual and rest of the alimentary tract, with the hope that this would bring about a localization and walling off of the inflammatory process, limiting it to the appendix and the immediate neighborhood, and the prevention of the development of peritonitis or other serious complications. This same treatment of Sahli's was emphasized and advocated in this country by Ochsner, and has been largely known as Ochsner's method of treatment. I think Ochsner's position has probably been very much misunderstood by some of the profession, and, con-

sequently, has resulted in a great deal of harm. I take it that Ochsner's position, as far as the safety and desirability of immediate operation is concerned, is the same as that of most of our American surgeons, and that he would advocate this medical management only in the event that the patient could not be given the benefit of early radical surgical cure.

My own position in regard to this question I want to make clear to you. I am personally convinced absolutely of the great safety and importance of recognizing these cases of appendicitis early and doing immediate early operation, and I am convinced that this will save many lives and much suffering. I frequently have made this remark in my clinic that in several thousand appendix cases that I have operated upon, I cannot remember of a single case that I regret having operated upon. On the other hand, I remember dozens of cases which I did not operate upon that turned out badly and were sources of great regret. I think my own experience is a fair test of that of the majority of surgeons. The only proper place for the medical management of appendicitis that I can find is in handling cases which cannot be given the benefit of early surgical treatment, and in doubtful cases where we are uncertain as to our diagnosis and feel that the cases should be kept under observation for a longer or shorter period to determine the diagnosis. During this waiting period rest and medical management should be instituted, and is of definite value, and in a third class of cases where, because of some serious organic lesion or old age, in weighing all the evidence, we might properly come to the conclusion in that individual case that observation and medical management would be a safer procedure. Where, however, the patient is a fair surgical risk, I have come to the conclusion that unless there are some such contraindications, no matter at what period during the acute attack of appendicitis the patient was brought to my service, the better and safer plan was to remove the focus of infection as soon as possible.

I would like to present to you my conception of the pathology of this condition. We have to deal with an acute pus infection of the appendix. How is this pus infection brought about? Is



it through the circulation, a hematogenous infection, or is it an infection beginning in the mucosa of the cecum and of the appendix as a local process? The admirable work of Rosenow seems to show that the inflammation is hematogenic, reaching the appendix through the circulation. I recognize, of course, perfectly the fact that this is possible and that it does occur, but to my mind, of the cases that have actually occurred in our clinical experience, the overwhelming majority were due to local inflammation and were not hematogenous. I want to present to you this line of reasoning in support of that position: In the first place, a considerable proportion of these cases are associated with fecal concretions or foreign bodies in the appendix. To be sure, fecal concretions are of themselves partly due to germ action, but they are of slow development, and an acute explosion resulting in the picture of an acute appendicitis from a foreign body or fecal concretion is, to my mind, clearly an infection beginning in the mucous membrane irritated by the presence of the concretion or foreign body and then extending to the other coats of the appendix. A local inflammatory process in the mucous membrane of the cecum is extremely common, as can be demonstrated by postmortem evidence and the finding of scars of old inflammatory processes. Inflammatory processes involving an area in the cecum the size of a dime might give rise to no clinical symptoms whatever, but the same size process involving the same amount of mucous membrane in the appendix would almost surely give rise to the picture of an acute appendical attack by interfering with the escape of the products of the inflammation from the appendix into the cecum.

Another piece of evidence that I would like to submit in favor of the inflammatory process being of local origin is the somewhat similar picture of diverticulitis, either in Meckel's diverticulum or in a diverticulum associated with the sigmoid. Here we have anatomic conditions which favor the accumulation of fecal concretions, retention of inflammatory products, and the development of an acute inflammatory focus, and I do not think that any one would claim that these cases of acute diverticulitis are hematogenous. I think we would all admit

that the inflammatory process begins almost always as a local condition due to abnormal anatomic conditions found in the diverticulum. I believe, therefore, that we should accept the idea of an acute inflammation of the appendix as being a local and not a hematogenous affair.

In regard to the organisms which are responsible for this condition—they are the colon bacillus, streptococcus, staphylococcus, and pneumococcus. A good deal of work has been done for the purpose of demonstrating that anaërobic bacteria are the essential cause of the infection and that the pus germs are secondary invaders. Personally, I do not believe that we have sufficient evidence on this point to accept this position, and certainly for the time being it would be safer for us to accept as the active agents the germs which we constantly demonstrate as being present in these cases.

I would like to say a few words in regard to the diagnosis. To be of the greatest value the diagnosis should be made very early, at a time, in fact, when we could not expect a completely developed symptom-complex that distinguishes the picture of appendicitis as described in our text-books. In the first few hours of the attack it is, as a rule, possible to make a definite diagnosis on the basis of but three symptoms, and these three symptoms are pain, tenderness, and muscular rigidity in the right lower quadrant of the abdomen. I have not infrequently operated upon a student who has walked in from the class-room or a nurse or an assistant who has met me at the hospital some morning with the statement that they have been suffering pain for several hours, and on examination found a history of this pain, definite tenderness over the appendix, and rigid abdomen, with, however, no vomiting and no increase in leukocyte count, and no increase in pulse-rate or in temperature, and have without any hesitation proceeded at once to the operation and removed an acutely inflamed appendix. May I not emphasize very strongly this fact, that in the first few hours of the attack we have the very safest and best time to institute surgical therapy. The diagnosis must be made upon these three pieces of evidence—pain, tenderness, and muscular rigidity. I would like, of

course, that the urine should be examined to eliminate a kidney or ureteral lesion, and if there is any possible reason to suspect such a source as the cause of the trouble, an x-ray picture and general vesical examination should be made to eliminate it. Especially should the chest be examined to eliminate any pneumonic process. Personally, I do not hesitate to urge operation on the basis of these symptoms alone. If, however, the patient is seen later, we may clearly expect to find an increased leukocyte count, slight elevation of temperature, and the vomiting which is so common may also have occurred. In making these early diagnoses of appendicitis in the first few hours one should be careful to try to eliminate the possibility of an intra-intestinal affair, such as colitis. I am always suspicious of the correctness of the diagnosis of appendicitis if there is an associated diarrhea. Fortunately, almost invariably in these cases where the trouble is within the colon, muscle rigidity is absent.

What shall we do with an appendicitis case that is brought to us not within the first twenty-four hours, but on the second, third, or fourth day? This is a problem that I have studied and worried over a great deal. I answer that now by saying with a good deal of confidence, that where I have the patient under my control and can give him the benefit of good surgery, I proceed at once to operate and remove the appendix, whether it be the second day, or the third day, or the fourth day, or any day during the acute attack, unless, of course, it is quite evident that he has practically recovered from that attack, in which event we might very properly wait for several weeks until the patient has recuperated. My position in this matter is that as long as the focus of infection is in the peritoneal cavity, it is a constant danger and a very probable source of general peritonitis, and the sooner it is removed the better. If the case comes to us with a large appendical abscess, we simply drain the abscess and advise a later appendectomy if the patient is in bad condition, or if it is evident that the dissection necessary to remove the appendix in the presence of the abscess will add a definite and considerable danger.

One of the numerous problems that we have submitted to



us is the problem of recurring attacks of appendicitis in patients who come to us between attacks. Here I do not hesitate to remove the appendix provided the patient gives a perfectly clean-cut description of the typical condition, and especially if I can obtain the evidence of the attending physician who took care of the patient during one or more attacks. We do, however, go over these cases very carefully and exclude any other possibility, such as kidney or ureteral stone, or gall-stones, and naturally these operations for recurrent appendicitis form a large proportion of our cases.

There is one phase of this question that I should like to discuss with you, and that is the so-called cases of chronic appendicitis, those cases that have never had an acute attack, but which are supposed to have a chronic infection in the appendix giving rise to slight distress in that region. I want to state my opinion on this subject very strongly, and it is that most of these cases are mistakes in diagnoses and not cases of appendicitis at all, and, personally, I do not recognize such a condition as chronic appendicitis which has never given rise to any acute symptoms. Almost invariably these cases are cases of colitis, constipation, associated often with the taking of cathartics, and clean up under medical management. Show me a clinic where any considerable proportion of the appendicitis operations are done for so-called chronic appendicitis, and I will show you a clinic where a large amount of unnecessary operating is being done. In this connection, too, I want to say a word in regard to the so-called *x*-ray diagnosis in cases of appendicitis. I personally place little confidence in *x*-ray diagnoses of these cases, and where the individual has really had definite attacks of appendicitis, it is much safer to base the diagnosis on the clinical picture. Where the patient has symptoms of so-called chronic appendicitis without ever having had an acute attack, I cannot believe that the *x*-ray evidence furnished is of any value. As I have already said, almost all of these conditions are bowel affairs and clean up under proper management.

CASE I.—The first case which we shall operate upon this morn-

ing is a man of about twenty-eight, who presents the picture of a neglected and recent acute appendicitis. He has been ill for about ten days. After the first few days of his attack he returned to his work. He felt very badly, but dragged himself about for three or four days. The pain and soreness then became so severe that he went to bed. Ice-bags were applied and the case was handled by rest, starvation, and opium. Not improving, he was brought to the hospital yesterday afternoon.

Examination shows a hard mass about the size of an egg in the region of the appendix. There is a good deal of tenderness, slight temperature, and a leukocyte count of about 14,000. From the size of the mass I am inclined to regard it as a small walled-off abscess with rather thick walls. On the other hand, it may be simply an inflamed appendix wrapped up in some edematous omentum. It is possible that if we simply watch this case the mass will gradually disappear and the man go on to recovery from this attack. On the other hand, it is quite possible that a rupture of the abscess might occur and a general peritonitis develop, and the man lose his life because of failure to receive proper surgical attention.

The patient is now anesthetized and I shall proceed to do the usual appendix operation which we employ in this clinic, and I ask you to follow me carefully as I describe the technic.

We make first an incision about 4 inches long, the center of which is about at McBurney's point. McBurney's point, as you know, is on a line drawn from the anterosuperior spine to the umbilicus, and, varying with the size of the patient, from  $1\frac{1}{2}$  to 2 inches internal to the anterosuperior spine. The incision is planned so as to be parallel with the fibers of the external oblique. I now divide through the skin and superficial fascia, and in doing this divide some small vessels in the superficial fascia, which are clamped. Usually these do not require ligation, but if they are of good size we ligate them at once. We now come down to the external oblique, and I make an incision parallel with the fibers, and this incision divides for about an inch the muscle tissue of the external oblique at the outer end of the incision, but for the greater part of the incision we have

simply passed through the aponeurosis (Fig. 100, *a*). With retractors the incision in the external oblique is widely pulled apart, exposing the internal oblique. Now without any cutting I shall separate both the fibers of the internal oblique and the transversalis. With two pairs of tissue forceps and with blunt dissection I spread the fibers apart for a distance of about  $2\frac{1}{2}$  inches up to the rectus muscle in the midline and outward toward the superior spine (Fig. 100, *b*). I want to emphasize the point that we do not use the knife in this separation, and I want to emphasize another point, that as you pass out toward the anterosuperior spine there is danger, unless we are careful, of injuring the circumflex iliac vessels. If these are torn, they should be clamped and ligated at once. I like to operate on these cases with the help of two assistants. I now introduce two more retractors, and I use rather blunt retractors for this purpose, so that I now have four retractors in the wound, one assistant separating the external oblique with a pair of retractors and the other assistant separating the internal oblique and transversalis with the second pair. This exposes the subperitoneal fat and the peritoneum for an area of about 2 inches square. I now divide the subperitoneal fat and peritoneum in the same line that I have separated the internal oblique and transversalis (Fig. 101, *c*). I want to call your attention to this fact because I believe it is a distinct improvement over the method formerly employed of making the division in the peritoneum parallel with the external incision. It gives one more room in the manipulation and the closure of the peritoneum is easier. I now open the peritoneal cavity and come down at once on the cecum, but external to and below the cecum there is a dense mass of tissue, which gave us the sensation of a tumor by external palpation. I find that this is edematous omentum, and as I carefully, by blunt dissection, separate this edematous omentum, I come down to a large, inflamed, edematous appendix, curled upon itself like a hairpin (Fig. 101, *d*). Rather to my surprise I find no pus, and the mass is composed entirely of edematous omentum and the hard, inflamed appendix.

You will notice that I do not pack in any gauze sponges in



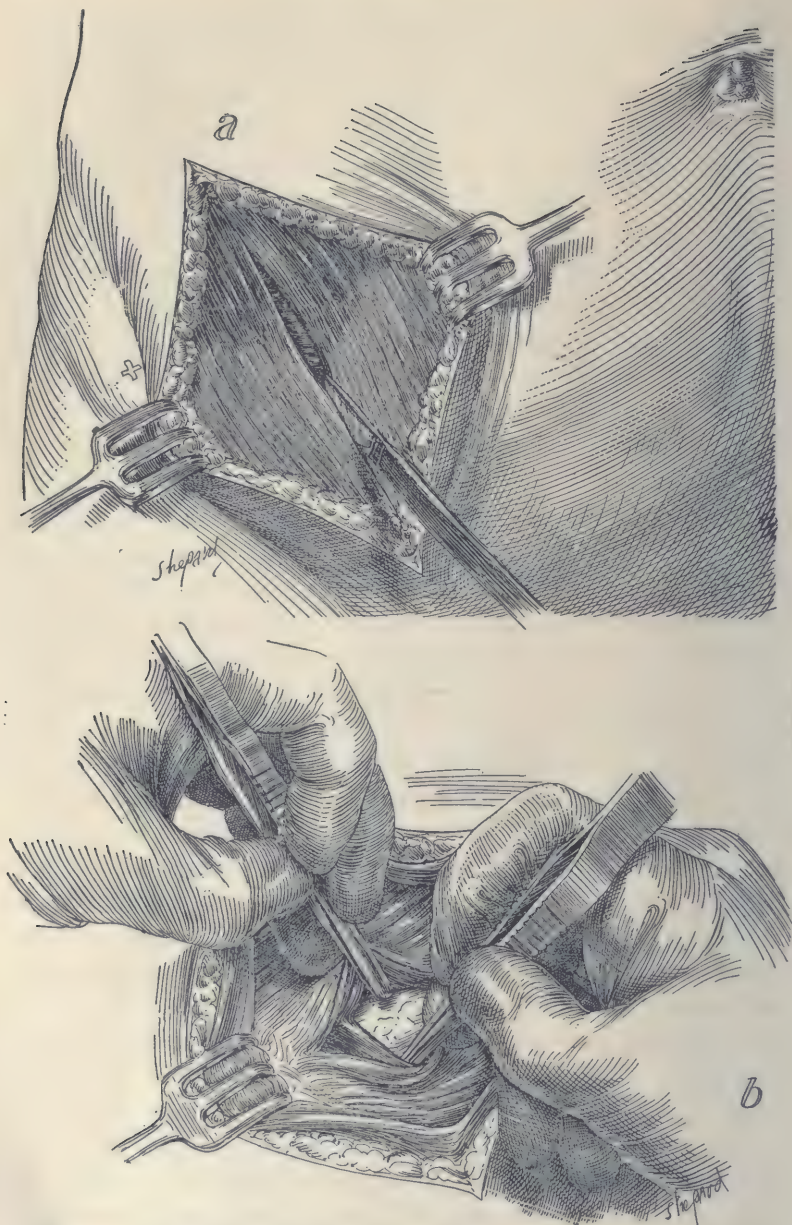
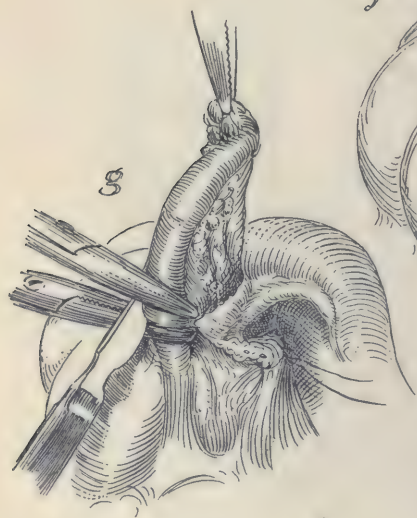
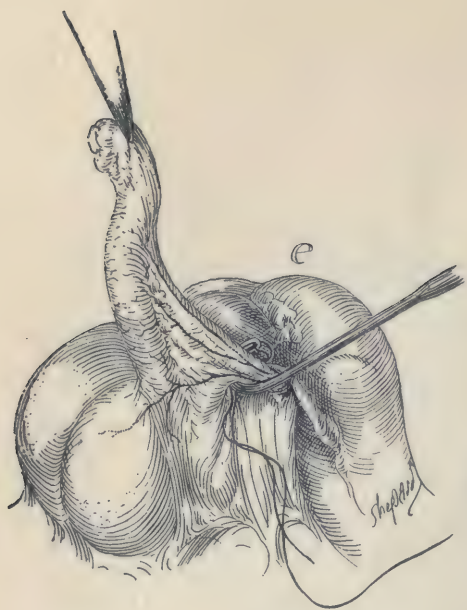


Fig. 100.—Muscle-splitting incision at McBurney's point (a) through skin and external oblique parallel to fibers of external oblique; (b) penetration of internal oblique and transversalis by blunt dissection.



Fig. 101.—*c*, Incision in peritoneum parallel to fibers of internal oblique; *d*, cecum drawn up, exposing base of appendix.





this case. There was a time when surgeons were very fond of doing what they called "walling off" of an area like this, using a number of abdominal pads, and this was done with a great deal of care and it was thought to be very important. For years now we have abandoned this walling off process unless it is definitely indicated by the presence of an abscess, and even where an abscess exists, if I can open it external to the cecum and can wall off the general peritoneal cavity from the abscess simply by using cecum itself for this purpose, I prefer to do that rather than to wall off with sponges or pads. This appendix, as you see, is adherent to the mesenterium, and it requires a dissection with tissue forceps and scissors to free it, so that we can bring the appendix and cecum well out of the wound. You notice too that the mesenterium is very vascular, and that instead of requiring a single ligature, as is the rule, it has been necessary for me to apply four ligatures in order to make sure of controlling the bleeding. The mesenterium is now divided after we have ligated it, and this very long, inflamed appendix is brought into view.

The technic of removing the appendix and treating the stump which we follow is one which we have employed in at least 2000 cases, and has given us very great satisfaction. We have had one run of more than 1000 consecutive cases of interval operations for removal of the appendix without a death. This, however, is not surprising, as it has been equaled and surpassed in a number of clinics. I, of course, do not include in that statement removal of the appendix in the face of complications such as peritonitis. I first clamp the appendix with a very heavy pair of forceps about  $\frac{1}{2}$  inch from the cecum. This heavy pair of forceps crushes the appendix at that point for the length of about  $\frac{1}{4}$  inch to a mere ribbon. I then put on a pair of forceps distal to this and cut off the appendix close to my clamp with a knife (Fig. 102, *g*). The surface of the appendix I then touch with some pure carbolic acid, using a sterile toothpick for this

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Fig. 102.—*e, f*, Mesenterium ligated and cut; *g*, appendix clamped and cut; *h*, appendix stump carbolized; *i*, removing excess carbolic acid from stump following its application on toothpick.

purpose (Fig. 102, *h*), and wipe off the excess of acid with some sterile cotton (Fig. 102, *i*). I now put in a purse-string suture about  $\frac{1}{3}$  inch from base of the appendix in the wall of the cecum (Fig. 103, *j*). It is desirable where possible to take in at least  $\frac{1}{3}$  inch of the cecum in this purse-string so as to make the subsequent invagination easy and closure complete. The first purse-string suture which I employ is of Pagenstecher linen and a non-absorbable suture. Now, grasping the cecum with a single layer of gauze between my thumb and finger close to the appendix, I remove the crushing clamp. You will notice that I do not ligate the appendix at all, but I pick up the ribbon-like crushed appendix with a pair of dissecting forceps without teeth and invaginate it into the cecum, and then tie my purse-string suture, completing the invagination (Fig. 103, *k*). Outside of this I now use another purse-string suture of fine catgut (Fig. 103, *l*). This, I think, is important. For a time we used a second purse-string suture of Pagenstecher linen, but I think in one or two cases it was responsible for a fistula that persisted for some time. This might be caused by a non-absorbable suture. My reason for not ligating the appendix is this, that there is distal to the point of ligation some material which must necessarily become necrotic, and I believe that it occasionally forms a focus for infection. The argument in favor of ligating the appendix is the argument supported by the surgeons who have had hemorrhage into the bowel following appendectomies where the appendix has not been ligated. I believe, however, that a careful study of the blood-supply of the appendix will show that if one can save a full  $\frac{1}{2}$  inch of the appendix and crush it, that there is no risk of a hemorrhage into the caliber of the bowel, even though no ligature is employed. Then I want to submit the fact that in my own work covering several thousand appendectomies in the employment of this technic we have never had a single case of hemorrhage. If a ligature is employed, I think one should be careful to use a fine ligature, removing almost all of the tissue distal to it.

The cecum is now dropped back into the abdominal cavity and the wound closed. First, a fine catgut closes the peri-

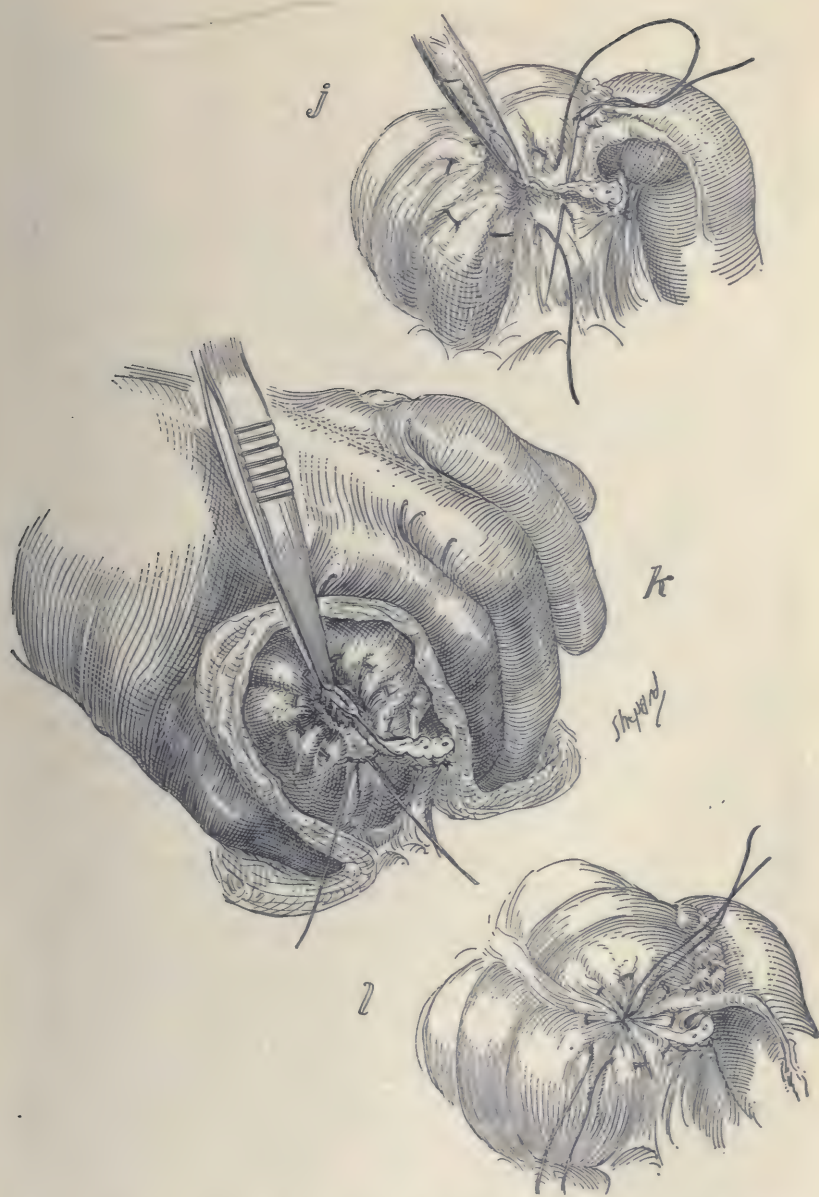


Fig. 103.—Insertion of first purse-string of Pagenstecher linen; *k*, stump invaginated into cecum and purse-string drawn taut. Note that stump of appendix has not been ligated; *l*, first purse-string tied and second, of catgut, in place.



toneum, and second, a moderate-sized catgut closes the transversalis and internal oblique. In employing this suture I want to caution you not to tie these sutures too tightly; simply approximate the muscle itself. It is not the purpose of the suture to strangulate the muscle, as one would do if he were ligating off a hemorrhoid, but simply to approximate tissues. A medium fine catgut is now employed, closing the external oblique, and if the superficial fascia layer is thick, as in a fat individual, I close this by two or three fine catgut sutures separately. The integument is now closed with fine silk. You will notice that I have used here a very small cigarette drain, simply passing down through the peritoneum into the cavity. I shall have this removed if there is no contraindication at the end of forty-eight hours.

The second patient is a young soldier who has recently been discharged from the service. He gives a history of having had two rather sharp attacks of appendicitis in the last six months, one about three weeks ago. The first attack was not clearly recognized as an appendix attack. During the second attack he was advised by the attending surgeon to have the appendix removed in the interval. He comes to us now with a pretty clean-cut typical picture of appendicitis and he describes his own case quite accurately. He emphasizes particularly the fact that for the first few hours after the pain began in the last attack the pain was diffuse, but very soon localized itself over the right lower quadrant, and that this for a time was exceedingly tender to touch, and that it is still distinctly more tender than any other portion of the abdomen.

We have gone over the case carefully with the idea of excluding any other possibility. We have examined the urine carefully, which was found negative, and have taken *x*-ray pictures of the kidney, ureter, and bladder to eliminate any possibility of kidney or ureteral stone. The *x*-ray pictures were negative.

The patient is now anesthetized and we shall proceed to the operation. I follow exactly the same technic as in the first case. On opening the peritoneal cavity and drawing out the

cecum I find that there is no evidence of an abscess and very slight evidence of any local peritonitis, although the end of the appendix is wrapped around the mesenteriolum and bound in that position for about 1 inch. This, however, is rapidly separated and the appendix and mesenteriolum brought into view. The terminal end of the appendix is clubbed and distinctly larger than the rest of the structure and is very vascular, as though it had been the site of a recent inflammation. I remove the appendix in the same way as in the previous case. We shall not employ a drain in this case, but make a complete closure.

On splitting open the appendix I find, in the club-shaped end, two fecal concretions, one about the size of a bean and one about half that size. These are of the consistency of putty and are surrounded by a little mucopus. The pathologic findings are perfectly in keeping with the short, sharp character of the attacks and with the persistent tenderness over the appendix.

I want to take this opportunity of discussing with you the most important side of this problem, that is, what might be called the complications, although, of course, they are the direct result of an acute appendicitis. Under this head I want to discuss the subject of appendical abscess and the subject of general peritonitis developing from an acute appendicitis.

Appendical abscesses today are not nearly as common as they were twenty years ago. Before 1889 all of our operations for what we know now as appendicitis were limited to the opening of appendical abscesses, and in the next decade until 1900 a large proportion of the appendix operations were done for appendical abscesses. Gradually, however, as we learned the importance of the early removal of an acutely inflamed appendix, and that by doing this we could prevent the formation of an abscess or a resulting peritonitis, surgeons more and more not only in this country but all over the world have operated so early that appendical abscesses are now the exception and not the rule, and occur for the most part necessarily in neglected cases. Appendical abscess in probably nine-tenths of the cases is in immediate contact with the appendix, and, therefore, in the right lower quadrant of the abdomen, and for the most

part associated with a perforation of the appendix which has become walled off by a local plastic peritonitis, burying the inflamed focus within the wall formed by the omentum and the mesenteries and coils of intestine. The position of these abscesses radiate out like the spokes of a wheel from McBurney's point. In addition to this usual and what might be called normal position of appendical abscess there are other locations which should be noted and kept in mind. First, an abscess extending down into the pelvis in the culdesac, especially on the right side, and occupying in the male the space between the bladder and the rectum, and in the female the position between the uterus and the rectum. Another location is one passing up the inner side of the outer border of the ascending colon, and if it is situated pretty well back it can simulate a perinephritic abscess as far as its location is concerned. Occasionally one finds a left-sided abscess, but this is exceedingly rare and is usually associated with a wide-spread local peritonitis involving the pelvis pretty extensively and extending to the left side. There are, of course, cases with the unusual picture of transposition of the viscera with the appendix located on the left side. In addition to these, one of the most serious abscesses following appendicitis is the subphrenic abscess, usually located on the right side.

There was a time when surgeons debated the question as to when was the best time to operate on these abscesses, and in Willard Parker's time, in 1870 and 1880, the rule was to wait at least a week, with the idea that after this period the abscess would become walled off and it could be operated on by the extraperitoneal route, and this idea had a pretty strong hold on many surgeons even during the period from 1890 to 1900 or even later. I believe, however, that this has been now almost entirely eliminated. My own view is that as soon as the diagnosis of abscess can be made, no matter where it is situated, effort should be made to handle it radically in a surgical way. Some years ago Morris Richardson, Professor of Surgery at Harvard, and a number of other surgeons advocated the handling of these cases of appendicitis associated with abscess in a two-



stage operation. They advocated first the drainage of the abscess and then later the removal of the appendix by a second operation after the patient had completely recovered from his acute attack. For a time this rule was pretty generally adopted. Then a good many surgeons, notably the late John B. Murphy, advocated removal of the appendix in practically all cases, even though it was associated with a large appendical abscess. I think I can express to you the position of the majority of surgeons now by saying this, that whenever in operating on a case of appendicitis associated with abscess the appendix can be removed without carrying marked risk to the patient, that this should be done at the primary operation, and, as a rule, this is possible. On the other hand, in the face of a large fecal abscess where removal of the appendix necessitates extensive trauma, carrying a definite risk to the patient, this should not be done at the primary operation, but the surgeon should satisfy himself in draining the abscess, leaving the removal of the appendix to a second operation. Of course this may not necessarily be required, as many cases of appendicitis associated with abscess have no attacks after their recovery from the operation for draining of the abscess. This was true in the case of the late King Edward of England, who was operated on by Treves, the man who contributed so much to the early development of appendicitis work in Great Britain. Treves simply drained in that case and there was no indication for further operation. Personally, I take this position in regard to these patients. Where I had not been able to remove the appendix or where I had been compelled to content myself with simply draining the abscess, I have advised the patient to later have the appendix removed at a second operation; I have found that so many of these cases have recurrences and sometimes serious complications that I believe this is sound advice.

In the operation for draining appendical abscesses the surgeon must be prepared for the occurrence of a fecal fistula after the drainage operation. This is usually temporary, however, and the patient usually recovers from the fistula without the necessity of any operation for the cure of that condition,

although, of course, some of the fistulæ are persistent, especially those that are associated with a large perforation at the proximal end of the appendix near the cecum, or those that are associated with foreign bodies in the appendix.

Large abscesses in the culdesac present an interesting problem. I prefer to attack these from the usual appendix incision, though sometimes it is preferable to make a midline incision. Large appendical abscesses in the pelvis projecting into the rectum or into the vagina are cases in which the route of attack should be carefully studied out. Often it is preferable to open these through the vagina or through the rectum rather than through the long tortuous route from above. These cases usually do admirably, especially those opening into the vagina.

One of the interesting problems in connection with appendical abscess on our service has been that of the abscesses which opened into the bladder. We have had a number of these and some have been very difficult to recognize. One patient that came under our observation about three years ago was admitted on the service of a colleague of mine with the diagnosis of prostatic abscess. There was a discharge of very fecal pus into the bladder, and later the escape of pus and gas and feces from the urethra. This was followed very promptly by an ascending nephritis from which the patient nearly lost his life; he had also marked symptoms of paralytic ileus. The patient was referred to my service and his life was saved by promptly doing a colostomy on the left side. This side-tracking of the feces and washing out of the bladder enabled us to clean up the cystitis, and later I made a laparotomy and removed the appendix which was found down in the culdesac, adherent to the bladder into which it had perforated. At the time that I removed the appendix I explored the pelvis very carefully and could find no fistula leading into the bladder. I subsequently operated on the colostomy and restored the continuity of the bowel. This, however, was promptly followed by a recurrence of the old symptoms, gas and feces coming out of the urethra, and marked constitutional symptoms, necessitating my at once re-establishing the colostomy opening. The patient has since

been in very good general health with the exception that he developed a bladder stone which was removed by suprapubic cystotomy, which failed to disclose any opening leading from the bladder into the bowel. He is now in very good general health and back at his original employment. He refuses, and I think very properly, any further surgical interference.

One of the most trying problems in connection with acute appendicitis is the problem of subphrenic abscess and liver infections. I think clinically one can divide these into two groups, subphrenic abscess and septic thrombus of the radicals of the portal vein. We have had thirty or forty subphrenic abscesses on our service following appendicitis. The clinical picture is sometimes obscure and sometimes pretty definite. In the typical case there is usually an acute exacerbation of symptoms with chills, fever, pain in the right side, high up above the appendix region, increased liver dulness and diminution in the area of normal respiratory sounds, and in many cases pushing of the liver downward below the costal arch and sometimes definite tenderness over the subphrenic area. One piece of evidence now at our disposal and which is of much value is a good x-ray picture showing the abnormally high stand of the diaphragm on this side. The diagnosis is usually made definite by the use of the aspirating needle locating the pus, and the pus can be evacuated, depending upon the situation, either by an incision parallel and below the costal arch in front, or by an incision in the lumbar region, or, what is more often necessary, by a transthoracic incision, resecting—depending upon the location of the abscess—the eighth, ninth, or tenth ribs, and reaching the subphrenic space transthoracically. This operation should be done, as a rule, under local anesthesia, and when the abscess is found, thorough drainage should be established. I think one of the criticisms that can properly be made on our handling of subphrenic abscesses up to this time has been that we have, as a rule, not provided sufficient drainage.

The cases of liver infection following appendicitis are of two general groups: one, liver abscess, and the other, septic thrombus of the portal vein or the radicals of the portal vein. This



is a most serious complication and one that is usually fatal. Abscesses of the liver following appendicitis are usually multiple, and on that account are difficult to handle successfully surgically. The septic thrombus of the portal vein gives an almost absolutely hopeless picture. The symptom-complex is that of a septic thrombophlebitis as far as the constitutional signs are concerned—chills and fever coming on every day or every other day. The subjective symptoms are those of slight jaundice, although this may sometimes be marked, and, what is of most importance, the absence of other conditions that could account for the chills and the jaundice. Most of the cases of septic thrombus of the portal vein and multiple abscesses of the liver that we have had on our service following appendicitis have gone on to a fatal termination. There have been several peculiar exceptions to this rule which are hard to explain, where the picture seemed to be quite typical and the diagnosis quite definite, but after the condition had persisted for weeks, the chills and temperature gradually disappeared, the jaundice cleared up, and the patient went on to recovery.

But, after all, the most important complication of appendicitis is acute general peritonitis, which if not relieved is so generally fatal. We have, of course, studied these cases on our service during the last twenty years with great interest, and have lived through the development of modern surgical therapy which has accomplished such wonderful results in the handling of the majority of these cases in the last twenty years. During that period we have learned to recognize general peritonitis and treat it, so that the mortality which a generation ago approached 90 per cent. or more is reversed, and we are now able, under favorable conditions in the patients operated on early, to save 90 per cent.

I want briefly to outline to you our plan of handling acute perforative peritonitis cases. The diagnosis must be made within the first few hours, certainly within the first twelve hours, if we are to hope for much from surgical intervention. This diagnosis must be made on a few data—pain, tenderness, and muscular rigidity. We cannot afford to wait for a high leukocyte

count, for a marked increase in temperature, for a tympanitic abdomen, or the thready pulse and dusky face of dying peritonitis. If the patient is to be saved the operation must be performed because he has pain, tenderness, and a rigid belly. One must not wait for tympany and thready pulse, which are often not signs of the disease alone, but signs of impending death. In discussing the modern surgical management of peritonitis and attempting to estimate its value, we must assume that we have made a moderately early diagnosis and that surgical interference is undertaken within a reasonable period after the onset of the peritonitis. I should like to discuss the scheme of surgical management under several heads, viz: (1) anesthesia; (2) incision; (3) proper surgical disposal of the perforation or focus of infection; (4) testing the peritoneal cavity to determine if the peritonitis is local or general; (5) when there is free pus or noxious material in the general cavity, its removal by irrigation with normal salt solution; (6) drainage; (7) surgical dressing; (8) after-treatment—the modified Fowler position; (9) intermittent salt solution per rectum; (10) washing out the stomach; (11) question of medication, morphin and strychnin; (12) water and food by stomach; (13) paralytic ileus and the saline cathartic treatment.

1. *Anesthesia*.—The normal anesthetic in these cases is drop-ether, properly given. In cases in which the patient is in very bad condition and the operation short, nitrous oxid gas may be employed, unless there is a heart lesion, and then ether is safer.

2. *Incision*.—The first incision should be made over the suspected focus. As a muscle-splitting incision for an appendix case, or a median line incision above the umbilicus for a stomach or duodenal case.

3. *Perforation*.—The perforation or leak must be so handled as absolutely to prevent any further leakage. I would be very insistent on this point. I have too often seen cases in which the peritoneal cavity was simply opened and drained without closing the leak permanently, and in which the patient was almost certainly lost because the leak continued. The teaching

that if it is difficult and time-consuming, the leak should not be sought for and closed, is bad teaching. I should say that it is so important for the safety of our patient to close every leak or perforation of the alimentary canal causing peritonitis that a most thorough closure should be obtained even at the cost of some risk and time. It is only in extremely difficult cases, with patients in such bad condition that they will evidently stand nothing in the way of operative interference, except an incision and the introduction of a drain, that we should make an exception to the rule. In cases of peritonitis from suppurative foci other than the alimentary canal, as the uterine appendages, it is desirable to remove the focus entire if the condition of the patient permits; if the patient's condition is bad, we can trust to drainage alone with somewhat better chances than in the cases with alimentary canal perforation.

4. *Testing the Peritoneal Cavity to Determine Whether the Peritonitis is Local or General.*—This, to my mind, is one of the most important and interesting developments in the modern technic. As an illustration let me cite 2 cases of appendicitis.

CASE I.—A young man of twenty was brought into the hospital with a diagnosis of appendicitis. He had been ill several days; from the history, a perforation had occurred a few hours before. I operated at once and found a perforated appendix with free pus about it. This was removed and the stump invaginated into the cecum. I then took a female glass catheter and tested the abdominal cavity. I placed my thumb over the open end, introduced the point into the culdesac, removed my thumb for an instant, and then replaced it and withdrew the catheter, employing it in much the same way that one does a glass pipet in picking up urine from a bottle. As I withdrew the catheter I found the lower 5 or 6 inches full of creamy pus. I then knew that I had a free general peritonitis to deal with, and handled it accordingly.

CASE II.—A boy of ten gave much the same history. I operated on him in the same way, and when I tested his culdesac found nothing in the catheter except a small amount of clear peritoneal fluid, and I therefore handled this case as one



which was still limited to the region about the cecum, although the pus was free in that part of the peritoneal cavity.

5. *Pus in the General Peritoneal Cavity*.—When there is free pus or other noxious material widely disseminated in the peritoneal cavity, I believe that it should be removed by irrigation. No one would doubt the advisability of washing gross stomach contents out of the peritoneal cavity in a case of perforating ulcer of the stomach; why should we not do the same for fecal pus or any pus?

When I have tested the peritoneal cavity with a glass catheter in the way I have described and found free pus, I then make a small buttonhole counteropening in the median line just above the symphysis; through this a large glass tube is carried to the bottom of the culdesac; then through the main incision, whether for appendix or stomach, another similar tube is carried to the seat of the perforation or focus, and this is attached by a rubber tube to an irrigator filled with normal salt solution at 112° F., and the peritoneal cavity is flushed out with several quarts of this irrigating fluid until the fluid comes out perfectly clear. Practically no time is lost in this part of the operation, as we are closing the main incision while the water is running.

6. *Drainage*.—Rubber tubes should never be used in these cases for drainage, at least, unprotected rubber tubes. Cigarette drains are much to be preferred. A long cigarette drain made of a small rubber tube about as large as a No. 10 or 12 catheter, about which gauze and gutta-percha tissue is wrapped until it is the diameter of a lead pencil or little finger, is carried through the small buttonhole in the median line to the bottom of the culdesac. Similar drains are carried to the point of closure of the perforation or removal of the inflammatory focus and the rest of the main wound is closed.

7. *Dressing*.—The surgical dressing should be a copious, moist, hot wet dressing of hot boric solution. A moist dressing picks up the discharge better than a dry dressing. These dressings should be changed every six to twelve hours, as demanded by the amount of discharge—usually twelve hours is often enough, sometimes twenty-four.

8. *Position*.—The Fowler position is of much value for these patients, but, unfortunately, an exaggerated position has often been insisted on, to the great discomfort and disadvantage of the patient. I am sure that we have obtained all the possible benefits of the position by allowing the patient to lie flat in bed and elevating the head of the bed from 18 to 20 inches on two chairs. In order to prevent the patient from sliding down in bed a bolster is placed below the buttocks and held fixed to the head of the bed by strips of roller bandage. I should like to emphasize the importance of this method of using the Fowler position. I have seen patients positively tortured by being compelled to sit up in bed because the attending surgeon has been led to believe that this position was indispensable to the modern method of treating peritonitis.

9. *Saline*.—I think that we are all agreed that furnishing these patients with a large amount of fluid by the bowel is one of the important factors in securing for us our improved results. This matter has, however, been greatly overdone. Continuous irrigation by complicated apparatus is often insisted on, much to the unnecessary discomfort of the patient. The presence of a tube constantly in the rectum is annoying. What we desire to accomplish is to furnish the patient a large amount of water so that the kidneys can act well and excrete the toxins, and so that the system will have enough fluids for the comfort of the patient. This can be done by interrupted rectal irrigation with much greater comfort to the patient and with all the benefits that can be obtained from the continuous irrigation. The continuous irrigation, if pushed, may be a positive danger, sometimes producing edema of the lungs and of the extremities. The rule is to give from 8 to 16 ounces of normal salt solution every two to four hours, to be retained, and a cleansing enema once or twice a day.

10. *Stomach Washing*.—If the patient vomits repeatedly, the stomach should be washed out. I do not believe, however, in making gastric lavage the rule. If the vomiting persists, the lavage should be repeated. Great care should be taken to prevent, if possible, the development of acute dilatation of the

stomach, a condition very similar to paralytic ileus. If the patient does not vomit, or if the vomiting is slight and soon ceases, the patient should be given water by the mouth, at first in small amounts, and as the conditions improve, this can be increased, with a corresponding decrease in the amount given per rectum. If at the end of twenty-four hours after the operation the general condition is good, milk and Vichy in small amounts—an ounce each—every hour, can be begun.

11. *The Question of Medication.*—Morphin should, as a rule, be withheld; and still, in a large minority of cases, when the pain and restlessness are great, it is often of great benefit, giving the patient sleep, better respiratory action, and increasing his chances of recovery.

12. *Ileus.*—Paralytic ileus is sometimes a serious or even fatal complication. It is here that proper early use of saline cathartics has been of value. Most patients have more or less gas pains. These should be handled by stimulating injections given low in the rectum; I usually use magnesium sulphate and glycerin and water in equal parts. Where the distention is considerable and persistent, saline cathartics in small repeated doses, with stimulating enemas and strychnin in moderate doses, should be employed. In a few cases secondary operations for localized abscesses will be necessary, and in a few cases in which the ileus persists enterotomy will be required.

I have found that one of the most valuable means of combating paralytic ileus is castor oil in small and repeated doses. I usually give a teaspoonful every hour until peristalsis, with expulsion of gas and feces, is secured.

I believe that, following out this general scheme, we can, in cases early diagnosed and early operated on, succeed in saving a very large percentage of our cases of general peritonitis. And when our laboratory colleagues ask us what clinical surgery has done, we can tell them that for one thing it has solved the problem of peritonitis; that under favorable conditions it can save 90 per cent. of these patients who but a few years ago were almost certainly doomed to die.





## APPENDICAL ABSCESS AND CARCINOMA OF THE CECUM

*Summary: Case I.*—A patient, seventy years of age, with a movable mass in the right lower quadrant of the abdomen; diagnosis; appendical abscess discovered at operation.

*Case II.*—A patient of sixty with a movable mass in right lower quadrant of abdomen; diagnosis; resection of carcinoma with lateral anastomosis of bowel—technic.

### APPENDICAL ABSCESS

THE first patient on whom I shall operate today is one that gives a rather confusing clinical picture. It is an old lady of seventy, who came to me with the statement that six weeks ago she rather suddenly developed a pain in the right lower quadrant of the abdomen, associated with some temperature, some vomiting and marked constipation, and a good deal of tympany. At the end of about three days the symptoms subsided, and with enemas and laxatives she succeeded in getting her bowels to move and gradually recovered from the condition, so that within another week felt quite well again. Ten days ago she had a similar experience, from which she has recovered as far as any acute symptoms are concerned, and she comes to us this morning in fairly good condition. Her pulse and temperature are normal; there is no bloating of the abdomen; her bowels moved yesterday and the day before; she has not vomited. She has, however, some pain, or, rather, a sense of uneasiness in the right lower quadrant of the abdomen and some tenderness on pressure, and as I examine her I find a movable mass about the size of a lemon in the region of the cecum. It is moderately tender; not exquisitely so, and I confess that I am uncertain whether we have to deal with a carcinoma of the bowel or a walled-off appendical abscess which is so situated in connection with the cecum, the ileum, and omentum as to permit of a considerable degree of mobility. We have been confronted a number of times with just the same clinical picture, and in

some of the cases we have found that we had to deal with a walled-off abscess, and in others we have found, unfortunately, that the mass was a carcinoma of the cecum, and in still others, especially in young individuals, we have found that we had to deal with an ileocecal tuberculosis. I am glad of the opportunity of showing you this problem because it is confusing, and one must be prepared to find one of several different pathologic conditions responsible for the condition.

The patient is now anesthetized and I shall make the usual muscle-splitting incision that we make for an appendicitis case. Opening the peritoneal cavity, I come down to the cecum, and I find a movable tumor between the cecum, the ileum, and the omentum. It looks as though we had to deal with a neoplasm, but as I carefully peel off the adherent omentum, you will see in there a small abscess cavity filled with thick yellow pus, and as I empty it out you will see that there is altogether probably 2 ounces of pus in this cavity. I cannot as yet see the appendix, but, following the longitudinal band of the cecum downward and continuing my separation, I now bring the appendix into view, and find that there has been a perforation on the side of this short, thick-walled appendix communicating with the abscess cavity. I separate the appendix with a good deal of difficulty from the surrounding adhesions, ligating off the mesenterium. I invaginate the stump into the cecum with purse-string sutures, removing all the pus, which has a slight colon odor, carefully with moist sponges. It will, of course, be desirable to drain this cavity for some days, and I shall do so with a small cigarette drain, which has a rubber tube of good-sized caliber in the center, and close the incision in the usual way.

**After-history.**—The patient went on to a quite uneventful recovery. There was some suppuration from the abscess for three or four days, the colon odor disappeared, and at the end of about three days the cigarette drain was removed and a No. 12 American soft catheter was introduced in its place. The discharge continued slight in amount for another week, and the catheter was gradually shortened, and at the end of ten days was removed entirely.



## CARCINOMA OF THE CECUM

I am fortunate to be able to show you this morning another case which presents somewhat the same clinical picture as the one we have just operated upon, and yet in this particular case I think we are in a position to make a very definite diagnosis. This patient is a woman of sixty-two. She comes to us with the history of a gradually developing and rather marked constipation. She makes the statement that on four or five occasions she has had great difficulty in getting the bowels to move, but that finally with oil and enemas a bowel movement could be obtained, and then for a period of two or three days she would have more or less diarrhea. She has lost some weight and strength, although her general condition is good. As far as she knows she has had no temperature or chill or any evidence of constitutional infection. She has never noticed any gross blood in the bowel movements. She states that she has discovered a mass quite movable in the right lower quadrant of the abdomen.

She has been on my service for several days, and we have made a complete and exhaustive examination of the case. We find that as we examine this mass it is quite movable and seems to be about the size of my fist and situated in the position of the cecum. Examination of the feces shows a constant positive Weber, showing the presence of blood. An examination with a barium injection into the large intestine shows a definite filling defect which you will see in the x-ray picture. I have no hesitation in making in this case a definite clinical diagnosis of carcinoma of the cecum. She has no evidence of a general carcinomatosis. Her general condition is excellent, and we shall attempt to do here a radical operation, resecting the cancer, and I am hopeful that there has as yet been no regional or general involvement, and that the prospects of cure, if she recovers from the operation, are excellent.

Under ether anesthesia I make a very large muscle-splitting incision, the same that we use for an appendix operation. You will notice, however, that the incision is 7 or 8 inches in length, and that as I divide the external oblique I expose the internal

oblique from the anterosuperior spine to the outer border of the rectus muscle. I separate the internal oblique and transversalis parallel with their fibers by blunt dissection, and this gives me a very large opening into the peritoneal cavity. I now come down to a large tumor perfectly free. The omentum is not adherent to it. There is no evidence of inflammation or local peritonitis. There is, however, as I examine it a direct extension from the tumor of the cecum to the parietal peritoneum on the outer surface of the tumor, so that it will be necessary for me to excise an area about the size of a silver dollar of the parietal peritoneum which has grown to the tumor. I now examine the mesenteric glands and find they are not enlarged. There are no deposits in the liver. The carcinoma seems to be limited to the primary focus, and I shall, therefore, proceed to the resection. I shall do this in preference to the Mikulicz method of bringing out the tumor mass, sewing it outside of the wound, and later removing it, and still later curing the fistulæ by a plastic. The Mikulicz is sometimes necessary, but I prefer resection and lateral anastomosis whenever possible.

The first step in this operation is to divide the outer layer of the mesocecum and the mesocolon of the ascending colon. This outer layer is not vascular, and I divide it from the iliac fossa up to the hepatic flexure. As I do this I notice that there are some adhesions about the hepatic flexure, and my assistant reminds me of the fact that several years ago this woman was operated on for gall-stones, and these adhesions are due to that operation. I now bring the tumor out into the wound and the entire ascending colon and 5 or 6 inches of the terminal ileum. The next step will be to ligate off the mesentery of the cecum and that part of the ileum and that part of the ascending colon that we shall remove in the operation. This, you see, I can do with one large catgut ligature, ligating the vessels deep down at the root of the mesentery. I now divide the mesentery above the ligature and proceed to clamp off the ileum about 2 inches from the ileocecal valve and the ascending colon about 2 inches above the carcinoma; I use very heavy massive clamps for this

purpose. After leaving the clamp on for a moment I now ligate, with a strong silk ligature, first the ileum at the point where I have crushed it with clamps, and second, the ascending colon where I have crushed it. Now, putting on two other clamps close to the point of ligation so as not to allow the escape of any fecal contents from the section we are to remove, I divide the bowel at each side close to the point of ligation and remove it.

The next step is the invagination of the end of the ileum and of the end of the ascending colon. I do this with purse-string suture, putting the first purse-string about  $\frac{3}{4}$  inch back from the point of ligation, and the second purse-string over this, taking in about another  $\frac{1}{8}$  inch of the bowel so as to make a very complete invagination. I have used in these purse-string sutures Pagenstecher linen. I now make a lateral anastomosis between the terminal ileum and the ascending colon, doing this just as we do a gastro-enterostomy, using three rows of sutures and selecting by preference for the anastomosis in the colon the longitudinal band of fibers because the bowel wall is stronger at this particular point and the suturing is easier and safer, selecting for the anastomosis of the ileum a point directly opposite the mesentery. You will notice that I do not make a very large opening. An opening 1 or  $1\frac{1}{4}$  inches in length is quite sufficient because the contents of the ileum passing through the opening into the cecum are liquid, and an opening of this size is quite as large if not larger than the normal ileocecal valve.

There remains for us now the closure of the opening in the mesentery. This is quite important, because if we allowed this opening to remain at the point of resection, a loop of intestine might pass through it and become strangulated, and we might lose our patient from mechanical ileus as a result. I therefore very carefully with fine catgut close this opening in the mesentery. I now proceed to close the external wound just as we do an appendix wound. I shall, however, employ drainage in this case. I always do in these excisions of the bowel, believing that it is distinctly safer. For this purpose I use a small ciagarette drain and carry it down to the point of anastomosis.



The pads and sponges are accounted for and the patient is in excellent general condition. I think that the chances are about 80 to 85 per cent. that she will recover from this operation, and the prospects of permanent cure I should think would be 40 or 50 per cent., judging from our experience in these cases where we have been able to resect the carcinoma of the colon before there has been any regional or general involvement. I want, however, to change that statement somewhat, because for the moment I forgot the fact that this carcinoma had already invaded the parietal peritoneum. You will remember that we had to resect a part of the parietal peritoneum, and I think on that account we should modify our statement and say that probably the prognosis as to permanent cure would be 20 to 25 per cent. in this case.

I am very glad of the opportunity of showing you at this clinic these 2 cases so much alike as far as physical findings were concerned, and in a general way the clinical picture, and yet so different in pathology, one an appendical abscess and the other a carcinoma of the cecum. I would like to refer to another group of cases with which we have had considerable experience and in which the clinical picture is very much the same as in these two cases, and in which we have a combination of the two pathologic conditions, and that is the rather rare condition of a carcinoma of the appendix, which becomes the site of an acute appendicitis. I can do nothing further today than simply refer to this condition. It is one about which a great deal of surgical literature has now accumulated. The usual picture of these cases is that of a fairly definite appendix attack of moderate degree, with usually a palpable mass. The surgeon, believing that he has to deal with simply an acutely inflamed appendix, finds at the time of operation what appears like an acutely inflamed appendix containing pus, but usually with very thick walls. The majority of these carcinomas of the appendix that I have operated upon that have been acutely inflamed have been suspiciously large appendices. I would like to impress upon you the importance of very careful histologic examination of specimens of this kind that you remove, so as to determine at once

whether you have to deal with simply an inflammatory lesion or whether you have to deal with a combination of a neoplasm and an inflammatory lesion in the same appendix.

Of course, the problem naturally presents itself to one's mind that there may be some other pathologic explanation for the greatly thickened appendix, such as tuberculosis or actinomycosis. At any rate, whenever at an appendix operation there is induration or marked thickening of the appendix at any point, the surgeon should realize the possibilities in that case of carcinoma, tuberculosis, or actinomycosis, and should make a careful histologic study to determine the existence of such a complication, and this should be done at once, so that the patient may be given the benefit of a later secondary operation after the subsidence of the acute symptoms if it is thought that such secondary operation might enhance the prospect of permanent cure.

**After-history.**—The patient had a slight temperature on the second and third day up to 100.8° F. On the third day the cigarette drain was removed and a slight amount of pus with a distinctly fecal or, rather, colon odor made its appearance. A No. 12 catheter was introduced in place of the cigarette drain. The colon pus continued to discharge for about ten days. There never was at any time any fecal matter, showing evidence of a leak in the bowel. By the fourth day the patient's temperature was normal and she was able to take a soft diet. In spite of the discharge of colon pus about the drainage-tube the rest of the wound healed up very kindly and without any infection. The patient had no vomiting and rather free bowel movements—three or four times a day—liquid bowel movements beginning about the third day after operation. The patient went on to a complete operative recovery.





## AMPUTATION AT MIDDLE OF THIGH FOR GAS GANGRENE

*Summary:* Gangrene of the leg following injury to popliteal vessels by charge from shotgun; technic of amputation in presence of gas gangrene—the guillotine method superseded—general management—importance of the early treatment of wounds—debridement.

*January 15, 1919.*

I WANT to present to you this morning a case that is a rather unusual one in civil practice, but is one that has been met with thousands of times on the Western front during this war. The case, in fact, is identical with many extensive shell injuries of the lower extremities, which have been of necessity badly handled in military surgery in many instances because of the impossibility of transporting the patient at once to a hospital where he could receive proper surgical attention.

This boy is only fourteen years of age. Six days ago he was out rabbit shooting, and very thoughtlessly and carelessly poked the butt of the shotgun into a corn shock into which he had seen a rabbit run. As he did this the hammer of the gun caught in one of the corn shocks and was pulled partially back and then drove the firing pin with sufficient force to explode the shell. The shotgun was an ordinary single-barrel gun loaded with  $1\frac{1}{4}$  ounces of light shot. The barrel of the gun was in close contact with his knee, and the discharge tore out the structures in the popliteal space back of the joint, evidently injuring the vein and artery. The attending physician who was called was in hopes that he could save the limb. It was put up in an anti-septic dressing. It was noticed, however, after the accident that the leg became cold and then black and gangrenous up to the knee-joint. This morning he was brought by ambulance to my hospital service.

You will see that there is gangrene of the leg up to the knee-joint, and above that point the lower half of the thigh is quite swollen and edematous, and on palpation I find that it crackles,

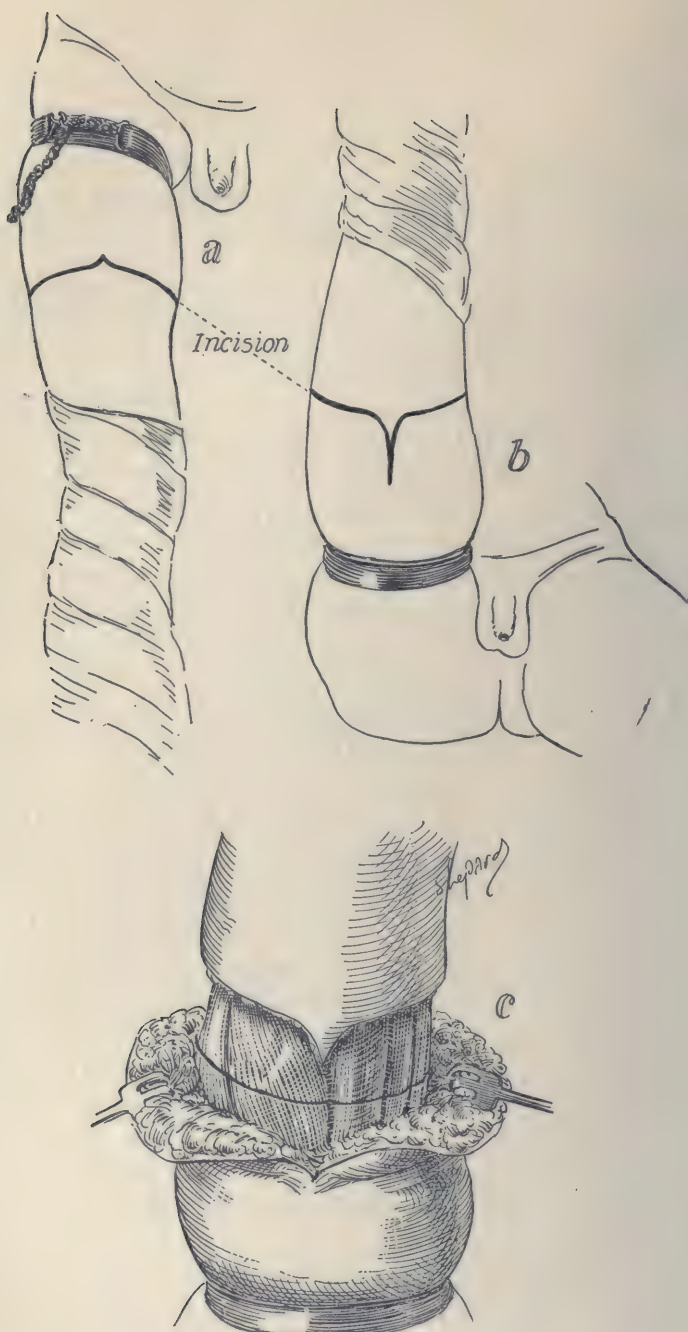


Fig. 104.

showing that there is gas infiltrating the tissues. It is clearly a case of gangrene from cutting off of the blood-supply, followed by a gas bacillus infection. The boy's general condition is very bad. His temperature is 104° F. and his pulse is very weak. He is dozey and it is very questionable whether we can save his life. I have told his father that the chances are about three to one against him, but that the only chance for him is to make an immediate amputation.

The boy is now anesthetized with drop ether. The dead limb is covered with sterile cotton and a gauze roller, and the entire thigh and buttocks and well above Poupart's ligament is cleaned up with tincture of green soap and alcohol. I now apply an Esmarch bandage as high up the thigh as I can, controlling the circulation so as to make the amputation bloodless, and have the boy lose as little blood as possible during the procedure. The gas gangrene extends up on the outer side of the thigh over the buttock, but not on the inner side. It is evident that I cannot make the amputation entirely above the infected tissue, and it will be necessary for me to divide the tissue that is already infected by the gas bacillus. I shall make the amputation through the middle of the thigh, and I shall do what I do by choice in these cases, a bilateral flap, making an internal and external flap, because in this way we can secure better drainage. I make what has been termed a "racquet incision" in making this bilateral flap: Beginning in the midline in front I cut through the skin and superficial fascia and then carry the incision posteriorly in the midline 2 or 3 inches higher than I did anteriorly (Fig. 104, *a*, *b*). I retract the skin and superficial fascia for a distance of about 2 inches, and then, as you see, divide the muscles of the thigh transversely at this high point (Fig. 104, *c*). Here in making the internal flap I come down to the femoral artery and vein, which do not bleed on account of the Esmarch bandage. I immediately clamp these with forceps and ligate them and, as you see, I put on a second ligature

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Fig. 104.—*a*, *b*, Esmarch bandage in place; racquet incision outlined; *c*, skin-flaps reflected; location for incision through muscles denoted by heavy black line.



for additional safety. I want to make the amputation as rapidly as I can and shall not make an effort to do what I should prefer doing in this case, making an aperiosteal division of the bone, but shall simply divide the bone transversely with the saw, in order to save time, at a level a little higher than that at which the muscles are divided (Fig. 105, *d*). You will notice, on the posterior and outer side of the limb, a marked edema from the gas bacillus infection which involves the superficial fascia at the point where we have made the amputation. The muscles themselves and the intramuscular layer seem to be pretty clean and normal. I pick up the sciatic nerve, draw it out, and cut off about an inch of it in order to make sure that it is not involved in the gross scar (Fig. 105, *e*). I pick up, in close contact with the sciatic nerve, the sciatic vessels and ligate them. I find in close contact, too, with the femoral vessels some other vessels of fair size, which are evidently bifurcating branches from the profunda. These I also pick up and doubly ligate, and as I look over the field I find four or five oozing points on which I apply artery forceps. Now I put a very hot gauze compress over the stump and ask one of my assistants to make some pressure on it for a moment while the Esmarch bandage is removed (Fig. 106, *f*). Having done this, I now remove this hot gauze pad and find three or four small bleeding points, which are seized with artery forceps and ligated. The hemorrhage is now completely controlled.

The problem that confronts us now is that of securing very excellent drainage and at the same time attempting to secure a good stump after wound healing is complete. I wish you would follow me now in the technic which I shall attempt in this case, and which I think is a much better plan than the guillotine amputation which was for a time strongly advocated by military surgeons during this war, but which has now been pretty generally discarded.

I take a broad strip of iodoform gauze about 5 inches wide and double it once and cover the entire surface, muscles, bone and all, with this gauze, bringing it out at the upper angle and at the lower angle of the incision. I now close the line of the

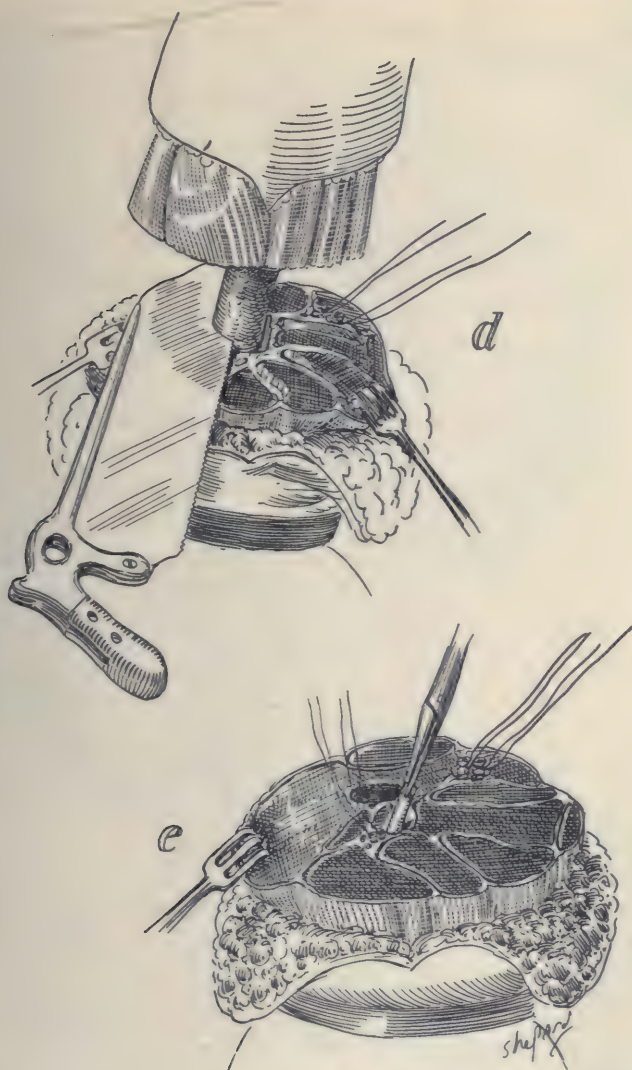


Fig. 105.—*d*, Incision through muscles completed, soft tissues retracted, with limb at the perpendicular, and bone being cut through; *e*, amputation completed; large vessels have been secured and the sciatic nerve has been drawn down preparatory to being cut off short.

incision over this gauze with silkworm-gut sutures, placing them about an inch apart. These sutures pass through the

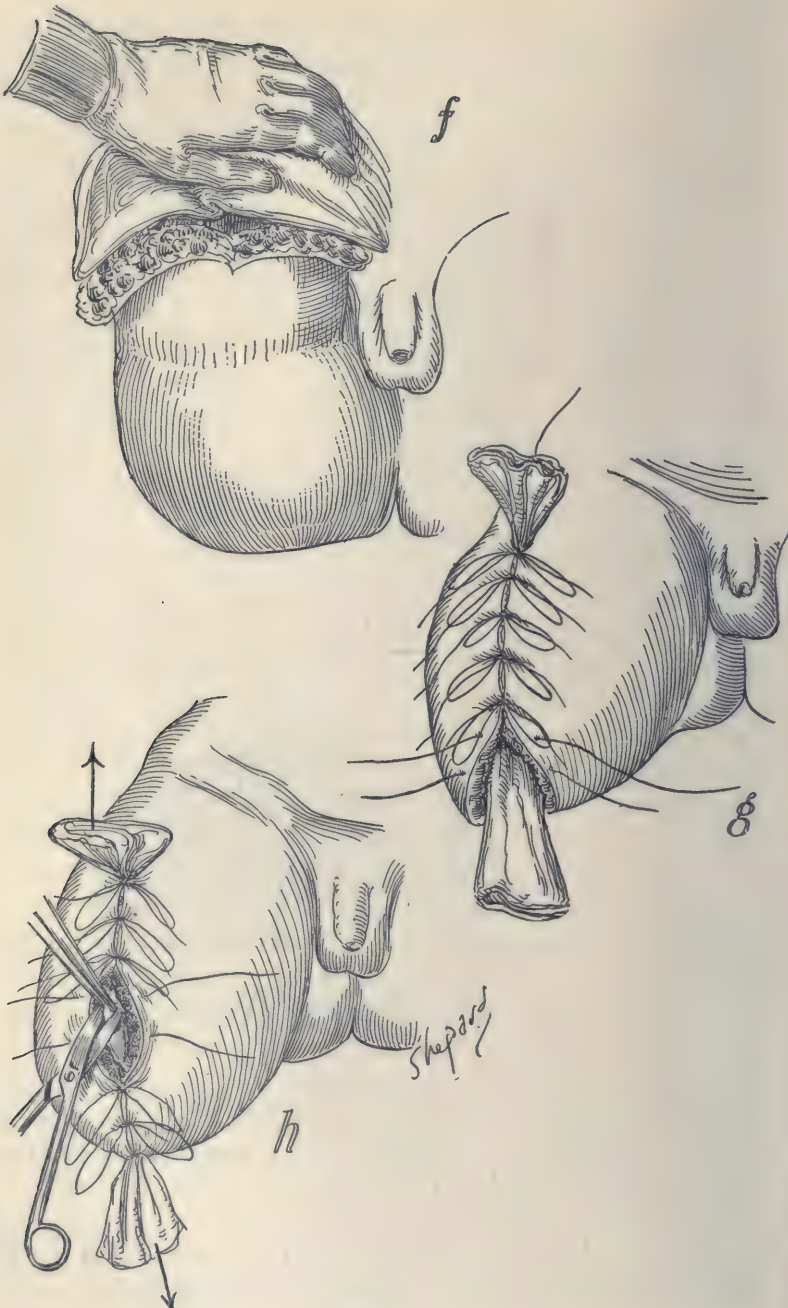


Fig. 106.



skin, superficial and deep fascia. I now tie these sutures not in a hard knot, but in a bow-knot, so that I can rapidly untie them and use them as secondary sutures. We secure, as you see, very good approximation of the line of incision. I shall apply over this a moist boric dressing, and a large absorbent dressing over that (Fig. 106, *g*).

The boy is in very bad general condition and will be treated as a shock case as far as we think this can safely be done. I would not advocate intravenous or subcutaneous transfusion in this case, but will place the patient in bed with the head well lowered and give him salt solution by the rectum. As we complete the operation I want to repeat to you what I told his father, that the chances are probably three to one against the boy's surviving the injury and the operation necessary for the removal of the gangrenous limb. Although we have removed the greater part of the tissues infected with the gas bacillus, there is still some remaining, and unless the boy has enough resistance to overcome the gas bacillus infection still remaining in his tissues he, of course, will succumb to the lesion.

#### AFTER-HISTORY

The boy had a great deal of shock from the amputation. The following morning he was very much brighter and in very much better condition, and was able to take liquid nourishment without vomiting and retained the normal salt solution per rectum very well. He still had a temperature in the evening of about 102° F. for several days, but dropping to normal in the morning. It gradually disappeared, so that at the end of the fourth or fifth day the temperature was normal. At the end

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Fig. 106.—*f*, A hot pad is placed over the stump as the Esmarch is removed; bleeding points are grasped with forceps and ligated as the pack is slowly removed; *g*, a large strip of iodoform gauze is laid over end of stump and the skin and fascia brought together over the gauze by silkworm-gut sutures, which are tied with bow-knots; *h*, removal of iodoform gauze pack. Four days after operation several of the sutures in the middle of the wound were untied and the wound was allowed to gap; the gauze strip was then cut with scissors and one-half pulled out through each end of the incision. The sutures were then retied.

of the fourth day the boy was sent to the dressing room. Two of the central silkworm-gut stitches that had been tied with the bow-knot were untied and the large layer of iodoform gauze that covered the entire stump was divided in the middle and then thoroughly soaked for ten or fifteen minutes with peroxid solution, 1 part to 4 parts of sterile water. At the end of that time the gauze was very carefully removed with very little bleeding and the silkworm-guts were tied fairly snugly, securing a very good approximation (Fig. 106, *h*). Within thirty-six hours after the amputation all signs of crepitation had disappeared and the boy seems to be going on to a very good recovery and with the prospects of a very good stump.

The case is illuminating from several standpoints. First, that the same sort of gas bacillus infection that has been so common on the Western battle front may occur in any individual on the streets of Chicago or in any village throughout the country, provided the factors essential to produce these conditions are present. In other words, there is nothing peculiar about the soil of Belgium or northern France, as has been stated by some military authors, which makes these extensive gas gangrene infections more apt to occur in those localities than in our own country. Those germs of the gas bacillus are present everywhere, here in Chicago as well as in Belgium. If we have extensive gunshot injury or extensive injury from any other violence which produces extensive devitalization of the tissues and drives dirt and clothing deeply into the tissues, if the patient is not given the benefit of good surgery, which would mean early removal of these devitalized tissues, foreign bodies, clothing, etc., the same destructive infections will result. That they have resulted so much more frequently in military surgery than in civil practice is due to the fact that these horribly lacerated wounds, with masses of devitalized tissue and impregnated with dirt and foreign bodies, are necessarily much more common in war than in civil life. Again, that they are more common in war than in civil life is due in part at least to the fact that in civil life these cases are more apt to receive prompt and immediate attention within a few hours after receipt of the

injury. In war, many of these cases lie out in No Man's Land for hours until the favorable period for handling the cases surgically is passed and until the infection is well established. It is now a well-recognized fact that if these cases can be handled within what is known as the period of contamination, within the first six or eight hours after receipt of the injury, and the devitalized tissues removed, and the dirt and foreign bodies removed by cleanly dissecting out the wound, we are able in 80 to 90 per cent. of the cases to sterilize this wound as we can sterilize the field of operation in making an aseptic abdominal operation and secure primary union by suture without drainage, provided the limb has good circulation. In this particular case if we had seen the case within the period of contamination, within the first six hours, we would have found at the time of the examination whether or not the popliteal vessels were so extensively injured that amputation was required. The amputation could have been made in this period of contamination with good technic so as to practically eliminate the danger of suppuration and gas gangrene.

*Note.*—A careful dissection of the amputated limb showed that there was a gross injury to the popliteal vessels, cutting off the blood-supply completely, making gangrene certain.





## ABSCESS OF THE LUNG

*Summary:* Abscess of the lung as a sequel of tonsillectomy; the two-stage operation—danger of producing empyema and a method of avoiding it.

*January 10, 1919.*

THE patient upon whom I shall operate this morning is a woman of thirty-five who has been transferred to my service from the service of Dr. James B. Herrick, with the diagnosis of abscess of the lung. Dr. Herrick has given me the following history of the case:

She had a tonsillectomy some weeks ago, and this was followed by pneumonia, gangrene of the lung, and the development of a lung abscess. I saw the patient first about three weeks ago and she was then coughing up a good deal of foul material, having the peculiar odor that is so frequent in cases of lung gangrene. I advised no operative interference at that time, though the physical findings were quite suggestive of lung abscess. Examination with an exploring needle had failed to locate the abscess definitely.

After our first consultation the woman improved decidedly for a week or ten days, and the temperature came down, and we were in hopes that she would go on to recovery without requiring any surgical interference. Her symptoms, however, have recently become more marked, the temperature has again gone up, the cough is very distressing, and the x-ray findings are now very definitely those of lung abscess. The clinical picture is also perfectly consistent with the diagnosis of lung abscess. She coughs up at intervals considerable quantities of very foul-smelling pus, and apparently after the cavity has been emptied she is relieved for a time, and then the pus reaccumulates and the distressing cough recurs.

I am going to operate upon this case under local anesthesia. We are doing practically all of our lung abscesses now without a general anesthetic, and I am very well satisfied with the use of local anesthesia. I shall use  $\frac{1}{2}$  of 1 per cent. apothesine with

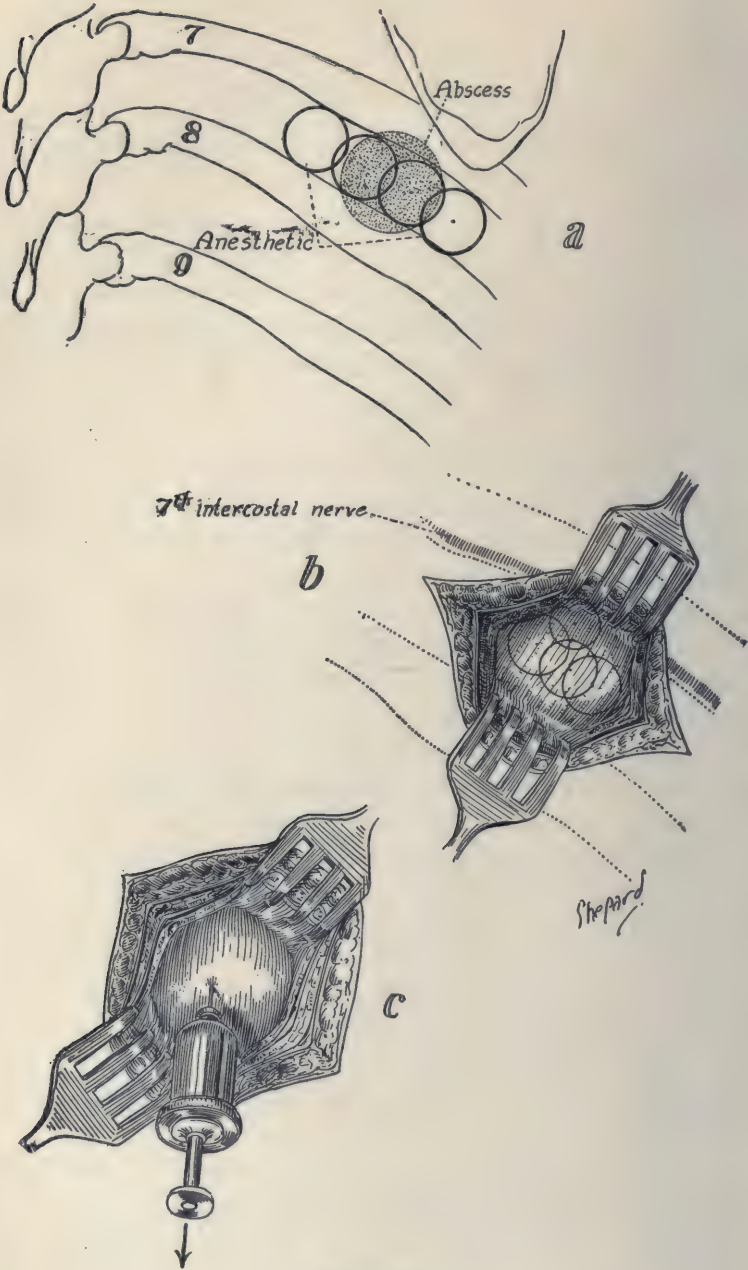


Fig. 107.



a little adrenalin. The x-ray plate shows that the abscess is in the seventh intercostal space 4 inches to the right of the spinous process. Before using the aspirating needle I am going to divide the tissues in this seventh intercostal space for a distance of about 2 inches in length down to the parietal pleura, and then I am going to determine whether or not the pleural space is obliterated at that point by adhesions between the parietal pleura and the visceral pleura. Infiltrating the tissues for about 3 inches, I divide parallel with the seventh intercostal space first the skin and then the superficial fascia, and come down now to the latissimus dorsi muscle which crosses the line of my incision almost at right angles. I shall divide the fibers transversely and not attempt to do a muscle-splitting operation because I want to obtain free, unobstructed access to the intercostal space. I now come to the external intercostal fascia covering the external intercostal muscle. I free this fascia until I can see clearly the fibers of the intercostal muscle. I infiltrate this and also the internal intercostal muscle, and I shall also block the intercostal nerve in its space in the groove under the seventh rib by injecting 20 or 30 drops of the solution in close contact with its sheath. I now divide the internal intercostal muscle and come down to the parietal pleura. I find that this is normal in appearance, and I can see, during respiration, the movement of the lung, showing that there is no obliteration at that point.

With a fine needle I now anesthetize the parietal pleura itself, and insert my exploring needle. I introduce it in the position which I think the abscess occupies. You will see that I at once draw into the syringe a fine stream of pus. I simply withdraw a few minims of the pus and make no effort to evacuate the cavity. I want to call your attention particularly to the fact that the needle which I am employing is a very fine one

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Fig. 107.—*a*, Location of abscess opposite seventh intercostal space and cutaneous area injected with apothesine; *b*, parietal pleura exposed and injected with anesthetic solution; note wheal made for blocking of seventh intercostal nerve; *c*, searching for the abscess with fine needle and aspirating syringe.

which will probably not permit of any leakage from the lung abscess into the pleural cavity when we withdraw it (Fig. 107, *a, b, c*).

What shall we do now with this case? If I open the abscess at this sitting I am almost certain to produce a very acute empyema on this side, which would be a most serious menace to the woman's life. Experience with a number of similar cases has taught us that it is much wiser to operate upon a case of this kind in two stages, the first stage which we have completed this morning, which should be associated with a procedure that will ensure obliteration of the pleural cavity at this point by an adhesive inflammation between the parietal and visceral pleura. Experience has taught me that the simplest and surest way of securing this is by the method which I shall now proceed to follow.

I shall pack some iodoform gauze into this wound, doing this very carefully, and I shall push the parietal pleura in front of this gauze probably  $\frac{1}{2}$  inch from the surface of the ribs for an area as large as that of a silver dollar. This presses the parietal pleura against the visceral pleura with this mass of gauze inside of the chest cavity, but outside of the pleural cavity. The pressure is sufficient to secure adhesive inflammation in this area within four or five days. We can then proceed with the second stage of the operation, that of definitely locating the abscess with a needle, and with the electric cautery cauterize a canal through the lung tissue probably the size of my little finger of sufficient size at any rate to secure good drainage of the pus. I shall not close the external wound in this case at all. I simply pack it with a little iodoform gauze and leave it open so as to make it accessible for the second stage of the operation.

I want to draw on the blackboard a diagram showing you the location of this iodoform gauze pack. This will give you a fair conception of just what is accomplished by it (Fig. 108, *d*).

#### AFTER-HISTORY

Four days after the operation the patient was again sent to the operating-room, the gauze was removed very gently after

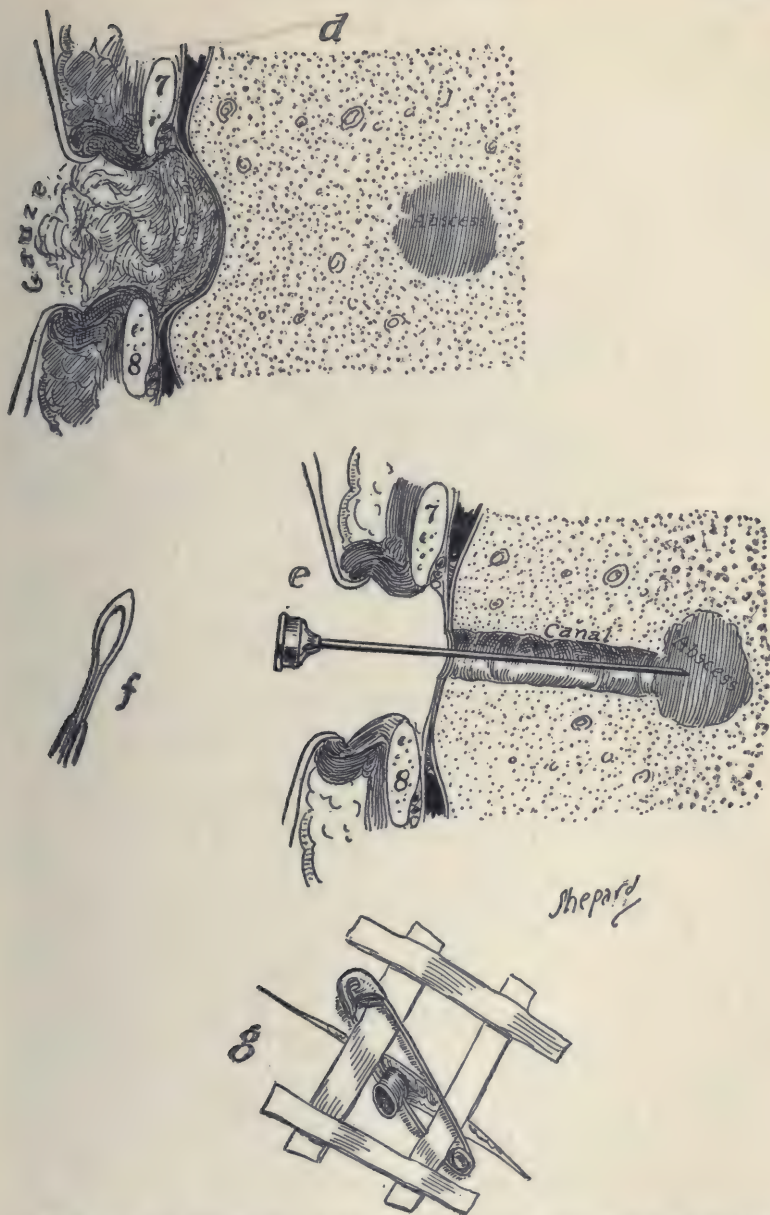


Fig. 108.—*d*, Completion of first stage of operation, gauze pack occluding pleural cavity opposite abscess; *e*, abscess located with large needle and tract burned out by cauterity (*f*), using needle as guide; *g*, method of anchoring drainage-tube.



it had been softened up with peroxid of hydrogen, the intercostal space was held apart with retractors, and it was found that adhesion had taken place between the visceral and parietal pleura, permitting of the second stage of the operation. This was comparatively simple. A fair-sized needle was introduced about 2 inches into the lung and the abscess found. The needle was left *in situ*, and with an electric cautery a canal was burned around the needle sufficiently large to introduce about a No. 14 American catheter. This entered the abscess and permitted of the escape of pus (Fig. 108, e, f, g).

The patient had a rather sharp reaction after this operation in the way of rise in temperature up to 103° F. The coughing gradually diminished. The discharge from the tube has been fairly profuse. The temperature is also diminishing, approaching normal, and she is on the road to a good recovery.

The after-history of these cases, however, is by no means a perfectly satisfactory one, only about half of the cases going on to complete recovery; the other half requiring permanent use of the drainage-tube for months or years, or a secondary operation, such as a thoracoplasty permitting the collapse of the chest wall at that point to obliterate the cavity, in order to secure permanent recovery.

I want to again emphasize the fact that this case followed a tonsillectomy, and that it is about one out of a dozen or more lung or brain abscesses that we have had on our service which have followed the apparently simple and supposedly safe operation of removal of the tonsils, an operation, however, which, as a matter of fact, carries with it, as shown by the experience of this clinic, a very grave danger. To be sure, this occurs in but a small percentage of the cases, but this complication is so serious that it is a strong argument against doing tonsillectomies unless the indication is absolute. The indiscriminate massacre of the tonsils which is going on at the present time should be strongly opposed by the judicial element of the profession, and unwarranted and unnecessary operations prevented in the future.

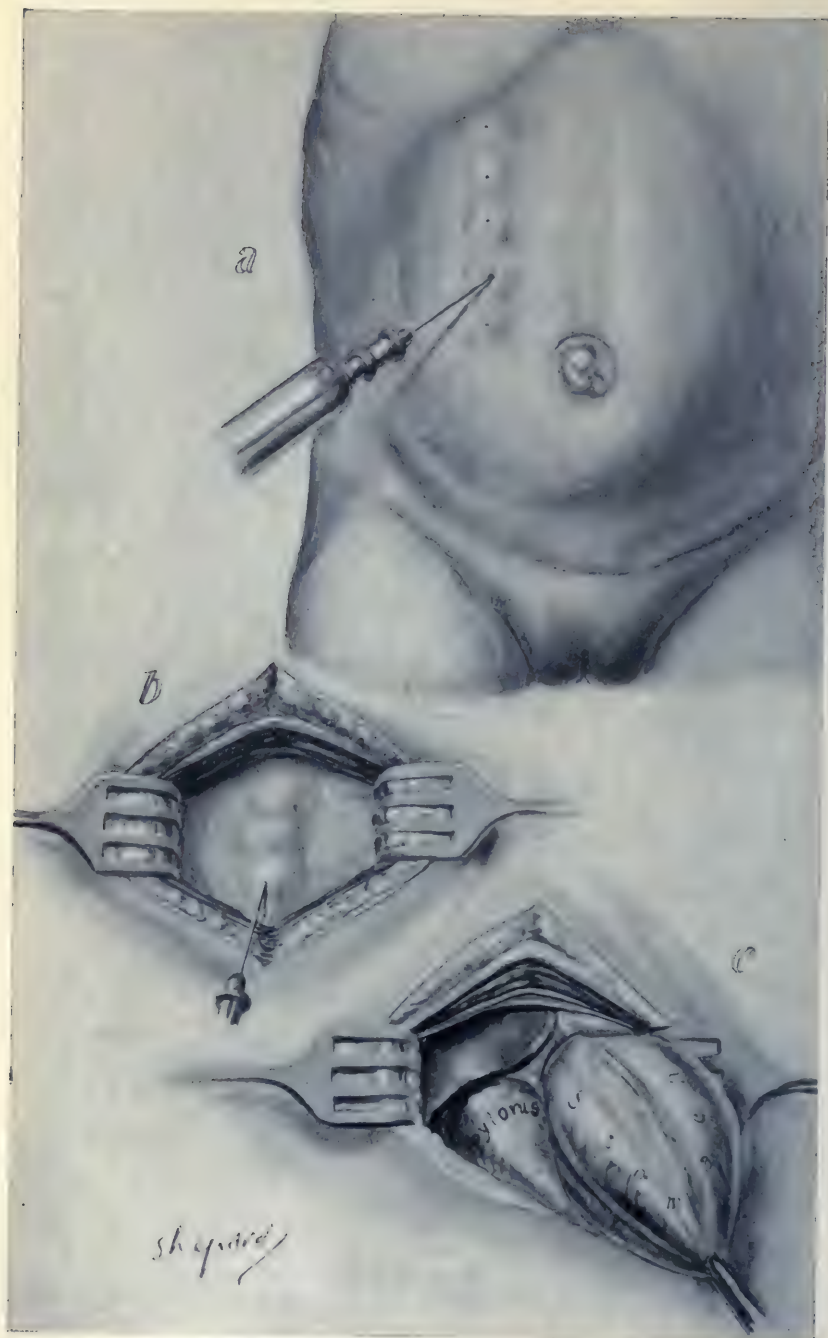
## CONGENITAL PYLORIC STENOSIS

*Summary:* A patient, six weeks of age, presenting typical symptoms of congenital pyloric stenosis; the Rammstedt operation under local anesthesia; technic of closure of abdominal incision—necessity for special care; congenital pyloric stenosis not a condition warranting medical management.

*January 13, 1919.*

I SHALL operate this morning a case of congenital pyloric stenosis. I want to present to you a technic which I regard as being of very great importance in this condition and as a great improvement, simplifying the operation, and I think without any question greatly reducing the mortality both from the operation and from the condition itself. I shall ask you, therefore, to follow me closely in the technic which I shall adopt in this case.

This child is six weeks of age. It has the typical clinical picture of congenital pyloric stenosis. Up to about the tenth or twelfth day the child's general condition was good and nothing unusual was noted. It then began to vomit and the vomiting became more and more persistent after food taking, until now, very shortly after anything is introduced into the stomach, it is ejected. The baby has lost weight and is in very bad condition and very weak, thoroughly exhausted and very much emaciated, and presents the picture of the wasting of starvation. There is present marked visible peristalsis. A tumor can be felt in the region of the pylorus and practically nothing goes through. There are no bowel movements. The child has been given fluids by rectum and an effort made to feed it by the stomach by the methods advocated by those who are opposed to operative interference and who are in favor of medical management. No improvement, however, has followed this scheme of solid diet. The baby is evidently in a condition where any general anesthetic would be a definite menace, and I will not hesitate to say that this child's chances under our old form of surgical management, of doing a gastro-enterostomy under





ether anesthesia, would almost certainly be zero. Fortunately, however, we have been able to simplify very much the technic required to relieve this mechanical obstruction, and we have accomplished this by adopting two plans of procedure, which I shall describe to you in detail. First, the very simple and efficient operation of Rammstedt, and second, what I regard of equal importance in these cases, we are now doing the operation under local anesthesia.

The child has been surgically prepared and I shall proceed at once to the operation. I infiltrate the skin over the upper part of the right rectus muscle for a distance of about 2 inches. I then infiltrate the superficial fascia and the anterior sheath of the rectus itself. I am using the usual solution employed in this clinic,  $\frac{1}{2}$  of 1 per cent. apothesine with 1 : 100,000 adrenalin. It requires, as you see, but a very limited amount of this solution, so limited that there is no danger whatever of any toxic effect from the local anesthetic (Fig. 109, *a*). I now make an incision 2 inches in length, beginning a little below the costal arch, and divide the skin and superficial fascia and anterior sheath of the rectus and split the rectus muscle itself. You will notice that the child cried when we injected the solution with the hypodermic syringe, but that during the cutting of the tissues it lies perfectly quiet as though it experiences no sensation whatever. The split rectus muscle is now held apart by two retractors and I infiltrate the posterior sheath of the rectus and peritoneum with 30 or 40 drops of the solution (Fig. 109, *b*). I now divide these and expose to view first the round ligament, which I pull to the right side, and then the margin of the liver itself. To the left of this I pick up the great curvature of the stomach with a pair of dissecting forceps without any teeth, so as to avoid injuring it. I now gently pull the pylorus into view and you will notice that there is a good-sized tumor at the pylorus, particularly large in this case, as large as the end of my index-finger. It is white, hard, and

Fig. 109.—Congenital pyloric stenosis: *a*, Infiltration over right rectus muscle; *b*, infiltration of posterior sheath of rectus and peritoneum; *c*, stomach pulled out, bringing pylorus into view.

grizzle-like (Fig. 109, *c*). I grasp it between the thumb and finger of the left hand, and, selecting an avascular area, I divide the peritoneum and a part of the hypertrophied muscle-fibers with a knife (Fig. 110, *d*). I then take a small pair of artery forceps and introduce them closed into the incision and then gently open them and spread the incision farther apart (Fig. 110, *e*). I do this first toward the stomach side of the incision, and you will notice as I separate completely the hypertrophied circular muscle-fibers a white fold comes into view.

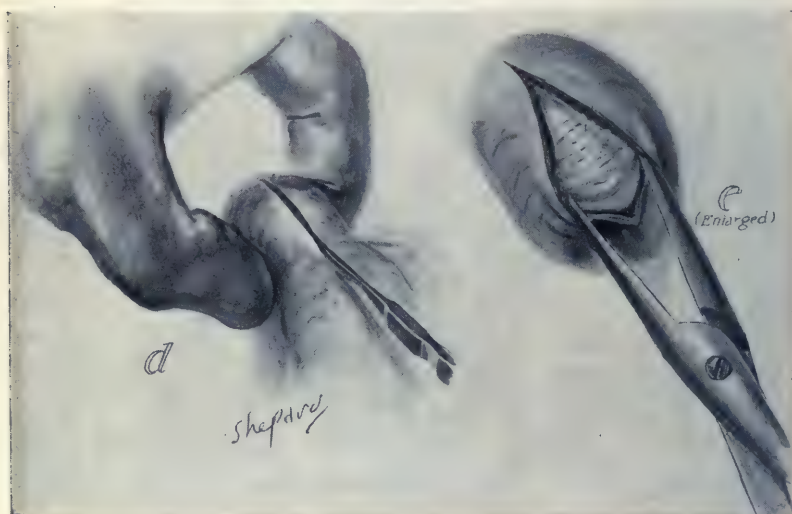


Fig. 110.—Congenital pyloric stenosis: *d*, Incision through peritoneum and muscularis; *e*, incision stretched with forceps.

It is the submucosa, and I extend the separation until I reach the duodenum. At this part of the separation I am particularly careful because the mucous membrane of the duodenum is much more delicate than that of the stomach, and I desire to avoid any injury whatever, and especially avoid making a perforation of its mucous membrane. There is practically no bleeding, and I drop the pylorus back into the abdominal cavity and close the external incision.

I want again to emphasize what I have emphasized in this

clinic a number of times—the great importance of making a very accurate closure of the abdominal wound in these cases, because wound repair is so slow in these little starved patients that the

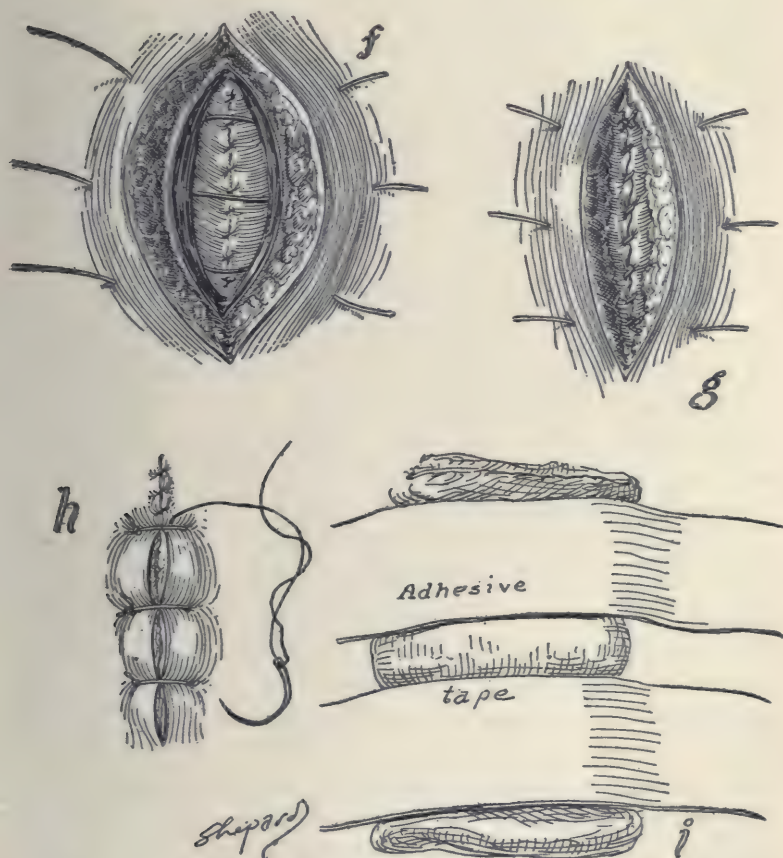


Fig. 111.—*f*, Peritoneum and posterior sheath of rectus closed, silk-worm-gut stay sutures placed; *g*, rectus and anterior sheath sutured; *h*, superficial closure; *i*, gauze dressing over wound held by strips of adhesive tape.

accident of opening up of a part of the wound after the sutures are removed is one of the dangers of the procedure, and this can be avoided by good technic. I close the peritoneum and posterior sheath of the rectus with a moderately fine catgut



suture. I use three silkworm-gut sutures through and through the rest of the abdominal layers (Fig. 111, *f*). I close the anterior sheath with catgut and the skin with fine black silk (Fig. 111, *g, h*). In addition to that, after applying a small dry sterile gauze dressing, I strap the wound with broad adhesive strips about 2 inches in width which go about two-thirds around the child's body (Fig. 111, *i*). I want to particularly emphasize this point, because even after the stitches are removed at the end of the tenth day this broad adhesive strap dressing should be replaced in order to prevent the possibility of opening up the wound, which, of course, is a serious and often fatal accident in these cases.

May I not take the opportunity of stating that I believe that with the local anesthesia and this Rammstedt operation we have at our disposal a very safe and very efficient method of handling congenital pyloric stenosis. I am personally not competent to criticize the medical management that has been advocated by a good many men in these cases as opposed to surgical interference, but as a surgeon I believe very strongly that in cases such as I have operated on this morning and such as we have had in 30 or 40 similar cases in the Presbyterian Hospital, where a definite tumor is found, such as we have found here, I cannot understand how it is possible for any scheme of feeding to overcome this gross, definite mechanical obstruction. Personally, I am thoroughly convinced that the cases which are cured by medical management are either cases of mistaken diagnoses or of congenital pyloric stenosis of a minor degree, and not such gross, definite obstructions as we have here this morning and as we have found almost invariably in the cases we have operated upon. I want to submit this proposition to you, for with our present simplified technic of doing these cases under local anesthesia and by this Rammstedt method we have now at our disposal a method that is so safe and so efficient that we should not hesitate to give these poor little chaps even in doubtful cases the benefit of the doubt, and before allowing them to get into a grave condition from starvation we should make an exploratory and determine definitely the condition and

relieve it by a Rammstedt operation if a gross, organic stenosis is found, and that it is much safer to do this than to make an extended trial of medical management. The pediatricians on the staff of the Presbyterian Hospital agree fully with the views which I have expressed. There are, however, a few pediatricians in the country still inclined to the medical management of these cases. I would like to have them reconsider this whole question in the light of the simplified and safe procedure which I have been able to present to you this morning.





## CARCINOMA OF THE LARYNX

*Summary:* Recurrence of cancer following thyrotomy and local excision of a laryngeal carcinoma; radical laryngectomy under local anesthesia; technic; after-treatment—method of feeding patient—position in bed; indications for operative management of cancer of the larynx.

THE case which I shall present for your consideration this morning is that of a man seventy-two years of age, who came to us about eight months ago with a small carcinoma of the larynx. It seemed to be a case that was very favorable for local operation. I therefore decided that instead of doing a laryngectomy I would do a thyrotomy, expose the lesion fully, and, after spreading open the thyroid cartilage, cut it out thoroughly with the electric cautery knife. This operation was done under local anesthesia, and the patient made an admirable recovery and seemed to be in very good general condition. Recently, however, he has had a return of his symptoms, and comes back to us with a definite recurrence distinctly larger than the original growth. I have gone over the case carefully with our laryngologist, Dr. McGinnis, and we have discussed two plans, one of using radium, and second, radical removal and complete laryngectomy. In weighing the facts and attempting to make a choice of procedure I have come to the conclusion that it would be better to do a complete laryngectomy, and I have submitted this to the patient and he has consented to the operation. I feel that radium would certainly be but palliative, and as it would necessitate the doing of a tracheotomy in order to prevent death from edema of the larynx from the sharp reaction that radium produces, I am strongly inclined to prefer a radical operation.

I shall do this under local anesthesia, using  $\frac{1}{2}$  per cent. apothesine, as we have been doing in this clinic for some time. I have already given the patient  $\frac{1}{4}$  grain of morphin and  $\frac{1}{160}$  of atropin, as I think that this will give him some additional comfort during the long and tedious operation. I begin now and infiltrate in the median line from just above the hyoid down to

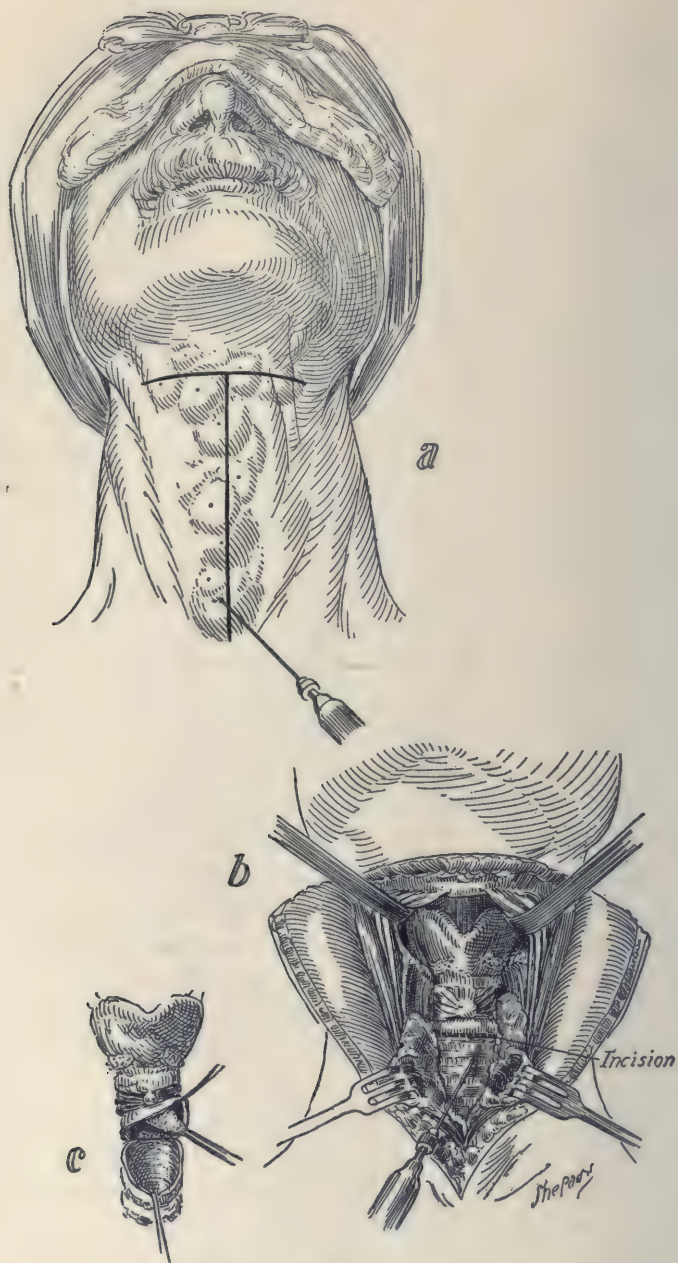


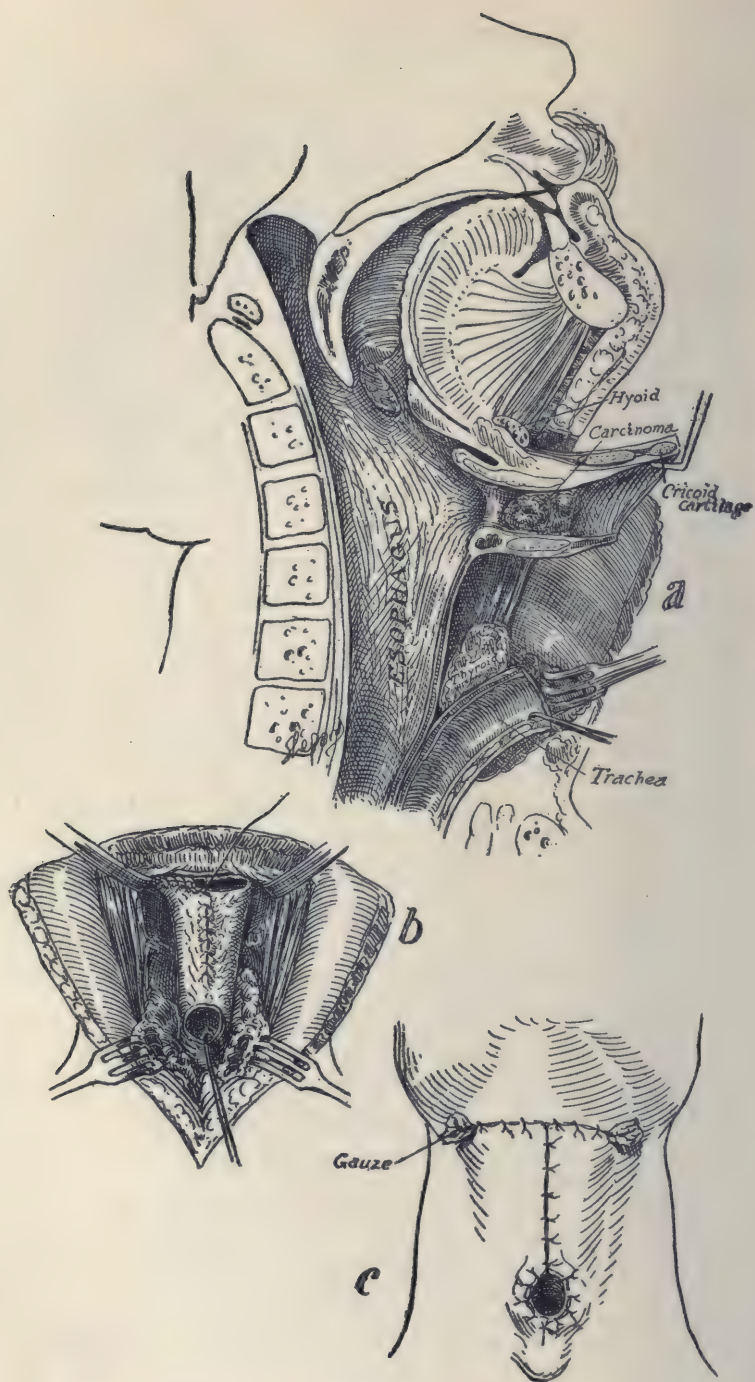
Fig. 112.

the sternum and then infiltrate a line transversely to this just above the hyoid, making an incision shaped like a cross (Fig. 112, *a*, *b*, *c*). I infiltrate this widely and shall use probably in the operation 5 or 6 ounces of the anesthetizing solution. I am sure that the operation will be very tedious and difficult because of our experience with similar cases that have been previously operated upon. I shall first dissect out the old scar of the previous operation, and, as I expected, the tissues are very vascular and the dissection made very difficult by the scar tissue binding the soft tissues widely to the thyroid cartilage and the trachea. You see that it is necessary to employ a large number of artery forceps, grasping every single bleeding or oozing point. I now gradually separate the sternohyoid and sternothyroid muscles on either side from the trachea and divide their attachments into the thyroid. I also divide the attachments of the thyrohyoid muscle at its insertion into the thyroid cartilage. I come down now just below the thyroid cartilage to the lobes of the thyroid gland. I divide the isthmus or, rather, the scar tissue at the point of the isthmus and free the trachea completely by lifting the lobes of the thyroid from it. This requires a clean dissection with a knife. The tissues bleed rather profusely. By lifting the bleeding edge of each half of the thyroid I control this bleeding by suturing it with fine catgut suture. I now very carefully and very completely free the larynx, separating all the soft tissues from it and also from the trachea as far down as the sternum (Fig. 113, *a*, *b*). Holding the soft tissues apart with retractors so as to expose the larynx and trachea, I now divide the trachea just below the cricoid transversely and open into it. You notice at once that the noisy breathing ceases entirely as I obtain a large opening into the trachea. I hold this opening apart with two sharp hooks and

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Fig. 112.—*a*, Infiltration of skin for laryngectomy; T-shaped incision is indicated by heavy black line; *b*, larynx and trachea skeletonized from thyrohyoid membrane to upper border of sternum; anesthetizing solution injected into wall of trachea just below cricoid cartilage—it is at this level that the trachea is severed; *c*, cocaineization of mucous membrane of trachea and larynx to prevent coughing and other reflex disturbances from the irritation incident to further operative procedures.





I cocaineize the mucous membrane of the trachea and larynx with 1 per cent. solution of cocain on a little cotton applicator. I am very careful to avoid allowing any blood from the wound to trickle into the trachea or larynx (Fig. 113, *c*). Waiting for a few moments to obtain the effect of the cocain, I now continue the dissection and separate the larynx from the esophagus behind. I do this with some difficulty on account of the previous operation, and there is a good deal of connective tissue which binds the esophagus and the trachea together. Grasping the trachea with a pair of forceps I now separate the trachea from the esophagus downward toward the sternum. I shall suture the trachea into the lower angle of this wound with six or eight black silk sutures. You will notice that we are not using a tracheotomy tube. I do not intend to use one either during the operation or if possible in the course of the after-treatment. Patients do very much better without a tracheotomy tube in these cases if its use can be avoided. I now grasp the larynx with a pair of volsellum forceps and pull it upward toward the chin and separate the esophagus from it up to the internal opening of the larynx. I then divide the esophagus from the larynx and, continuing my dissection, separate all the ligaments and muscles attached laterally to the larynx, and finally divide the thyrohyoid membrane and remove the entire larynx, including the epiglottis.

We have had splendid co-operation on the part of the patient during this long and trying operation. We have now a large T-shaped opening in the esophagus which must be closed, and I close this with fine Pagenstecher linen just as I would

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Fig. 113.—*a*, Schematic sagittal section through operative field. By means of a hook under the cricoid cartilage the larynx has been drawn out of the wound, stretching out the anterior wall of the pharynx and esophagus, thus making it accessible for the incision which will complete the separation of the larynx from its bed. The open end of the trachea has been drawn into the lower angle of the wound; it is protected from contamination by blood or buccal secretions by a strip of gauze; *b*, the triangular opening in esophagus and pharynx left by the removal of the larynx is tightly sutured; *c*, operation completed. Gauze drain in each end of the transverse incision and trachea sutured into lower angle of sagittal incision.

sew up the intestine. I cannot make an absolute waterproof closure because these tissues do not lend themselves to accurate approximation as does the intestine, but it is not essential to have an absolute water-tight closure at this point. I now close the large skin incision with silkworm-gut sutures and pack in each angle of the transverse incision a strip of iodoform gauze down to the point of closure of the esophageal opening, and at the lower angle I also introduce a very small piece of iodoform gauze for  $\frac{1}{2}$  inch between the trachea and the sternum.

The after-management of this case is of great importance and must be carried out with great care. For the first twenty-four hours we shall give the patient normal salt solution by rectum. After that it will become necessary that we feed him through the esophagus, and we have worked out an efficient and successful technic for this purpose. Assuming that the posterior wall of the esophagus is intact, we carefully introduce at the end of twenty-four hours a No. 14 American rubber catheter through the mouth into the esophagus and well down the esophagus for a distance of about 10 inches, and then with a funnel pour the necessary amount of water, milk, thin gruel, etc., into the stomach. This prevents any leakage of food through the esophageal wound and supplies the patient with the necessary amount of nourishment. This method of feeding the patient must be continued from ten to fourteen days. The patient is in some shock, and for the first few hours I shall leave instructions to have the head of the bed lowered or, rather, the foot of the bed elevated so as to place the head about 12 to 18 inches lower than the foot. This position is favorable to counteracting shock, and at the same time, by gravity, there will be a tendency for any blood or mucus to run down and out of the trachea, lessening to a certain extent the danger of aspiration pneumonia. However, within a few hours, when the patient has reacted, let us say eight or ten hours after operation, we shall reverse the position and put him up in bed at an angle of about 30 degrees on a back-rest. By that time he will have so far recovered that he can cough up the sputum and blood, and we have found from experience that patients are



much more comfortable in this semi-elevated position than they are in a recumbent position, and I believe there is less danger of a resulting pneumonia.

I want to express to you my views about the surgical handling of these cases of carcinoma of the larynx based upon the experience which we have in this case and the experience which we have had now in a considerable number of cases. In small carcinomas of the larynx I have hesitated to urge a complete laryngectomy, and I have tried now in a number of cases to cure the patient by the local operation of thyrotomy and simply destroying with the electric cautery the portion of the larynx involved. I have, however, during the last year had the unfortunate experience in three of these cases to find that the lesion recurred. On the other hand, in those cases in which we have done a laryngectomy we have been fortunate in curing a great majority of them when we have operated at a time when the lesion was still intrinsic and did not involve the tissues outside of the larynx. In handling these cases, therefore, we are prone to give the patient the benefit of the less mutilating operation of thyrotomy and local removal of the cancer when the lesion is small, instead of proceeding at once to do a complete laryngectomy. On the other hand, the results of our complete laryngectomies have been so much better from the standpoint of permanent cure than the results obtained by the minor operation that I confess I am growing more and more converted to this point of view, that local operations in the larynx for cancer are not often curative and require in the large majority of the cases a later complete laryngectomy, the patient in the meantime running the risk of such invasion of the tissues as to make a laryngectomy impossible or one that carries with it much danger of recurrence. Now, on the other hand, a complete laryngectomy done for cancer of the larynx when the lesion is small gives an excellent prospect of permanent cure, probably as good or a better prospect of cure as operating for cancer in any other position of the body. The cancer is enclosed in a cartilaginous box, lymphatic involvement is slow and late, and when the lesion is distinctly intrinsic I do not hesitate to

state that I believe the majority of cases can be cured permanently by complete laryngectomy. The patients, to be sure, are rather in a somewhat handicapped condition, but, surprising as it may appear, they endure this handicap very cheerfully and soon learn to breathe comfortably through the trachea just above the sternum, they learn to protect it with a little wire screen covered with gauze, and they enjoy life as much as any patients I have ever operated upon. The difference between difficult breathing and danger of death from cancer of the larynx compared with perfectly free breathing and a knowledge that they have been relieved of their cancer is most gratifying to these patients. I am rather inclined to analyze this whole subject in a judicial way and to give you these conclusions: that in very small carcinomas of the larynx, early discovered, thyrotomy and local removal may be justified. If this operation is done, however, one should recognize the very considerable dangers of recurrence. I state this on the basis of my experience; if there is the slightest evidence of recurrence, an immediate laryngectomy should be made. In several of my permanent cures in laryngectomy for cancer of the larynx we have had identically the same experience as we have had in this case, first, the attempt at local removal and recurrence, and finally a complete laryngectomy with permanent cure. In carcinoma of fair size involving both sides of the larynx or involving one side completely I would not hesitate to advocate very strongly a complete laryngectomy.

## CLINIC OF DR. FRANKLIN B. McCARTY

RUSH MEDICAL COLLEGE

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### FRACTURE OF THE CARPAL SCAPHOID

*Summary:* Mechanism and types of fractures; symptoms—crepitus, deformity, and false point of motion lacking; demonstration of local tenderness; diagnosis; treatment of uncomplicated fracture—of fracture with dislocation—of old cases.

FRACTURE of the carpal scaphoid is a common injury, infrequently diagnosed and consequently often followed by permanent disability of the wrist. Many wrist injuries which show no injury to the radius or ulna are treated as sprains with unsatisfactory results, simply because attention was not directed also to the small bones of the wrist wherein lay the real bony injury. The economic loss resulting from more or less marked permanent impairment of wrists of men in industrial pursuits makes essential the careful examination of the carpal bones in every injury of the wrist-joint. The signs of this fracture are distinct and characteristic, so that diagnosis from physical examination alone is not difficult. In an out-patient clinic 23 cases were encountered in a period of two months, and in each instance diagnosis was made previous to x-ray examination.

**Mechanism.**—This is essentially a fracture of adult men, due largely to their greater liability to injury of the type which produces such fracture. It occurs almost always in young men of good development who are engaged in muscular work or sport. Injury occurs by direct violence transmitted through the hand, rarely by a blow directly over the bone. There is a history of a fall backward with hand and arm rigidly outstretched so that the full force of impact is received on the ball of the thumb, the hand being hyperextended and deviated toward the ulnar side (Fig. 114).



The scaphoid has roughly the shape of a hollowed out crescent with blunt ends and a constricted neck near the middle. The proximal half is almost entirely articular and the distal portion is largely fixed by ligamentous attachments. With the hand hanging by the side the concavity of the bone fits snugly against the rounded surface of the os magnum, so that in falls with the wrist extended and not deviated to either side the two bones act practically as one, and the force is transmitted higher



Fig. 114.—Mechanism of fracture of carpal scaphoid. Arrows show direction of force. Note branch of radial nerve running over posterolateral aspect of scaphoid, pressure on which causes pain, which may occasionally lead to confusion in diagnosis.

up, with resultant injury to the radius or to the styloid of the ulna. With the hand extended and deviated to the ulnar side, however, there is a certain amount of play in the wrist-joint, the proximal articular portion of the scaphoid moving laterally, while the distal portion remains fixed in place. This change in position may be easily demonstrated by placing the finger-tip over the upper end of the snuff-box and alternately adducting and abducting the hand. As a result of this motion the long axis

of the scaphoid lies almost directly in line with the forearm and the entire force of the blow is transmitted through it. Fracture occurs at the narrowest and weakest part—the middle of the arch, the concavity of which is reinforced by bony support from the os magnum, but the convexity of which is unsupported except by ligaments. The same situation exists as when a curved stick, thick at both ends and narrow in the middle, is stood endwise on the ground and struck a heavy blow on the upper end. Naturally, the fracture occurs transversely across the narrowest portion. It is notable that fracture of the scaphoid is rarely complicated by other bony injury, whereas fracture of the lower end of the radius is commonly accompanied by fracture of the ulnar styloid.

The fracture may be clean cut or comminuted and impacted, the former being the rule (Fig. 115, *a, b, c*). The line of fracture runs transversely across the narrow neck, and is so located that the upper fragment includes the entire radial, the semilunar, and part of the os magnum articulations, forming a fragment which is almost entirely articular and which is attached only to the annular ligament, firmly in front and loosely behind, and by the intercarpal ligament to the semilunar bone. Hence the mobility and more frequent tendency to anterior displacement of this fragment rather than the distal one, which is firmly wedged and bound into place. Casual examination of a dislocated proximal fragment of scaphoid may readily lead to confusion, both clinically and by *x*-ray, with dislocation of the unfractured semilunar. Stereoscopic *x*-ray definitely clears up any question of diagnosis.

**Symptoms.**—The symptoms of simple scaphoid fracture are, in general, those of sprain of the wrist, without the accompanying physical signs of sprain. The outstanding symptoms of fresh fracture are pain, tenderness, limitation of motion, weakness, and swelling. The other cardinal signs of fracture—*i. e.*, crepitus, deformity, and false motion—are lacking, nor is ecchymosis often found.

1. *Pain* is of moderate severity, but very persistent. With the hand at rest and supported, so that the muscles are inactive,

there is little pain even in recent injury. When the hand is used and the joint put into motion, pain is quite marked and becomes intolerable when extremes of motion are attempted. Particularly is this true of hyperextension and adduction, either of which motions produce severe pain localized to the radial side of the wrist and definitely below the line of the radial articulation. Sharp pain is also elicited on pressure directly upward against the ball of the thumb directly in the line of the radius.

2. *Tenderness* is definitely limited to the region of the bone itself. The proximal half of the bone lies directly beneath the snuff-box, the hollow depression formed between the tendons of the extensor longus pollicis and extensor brevis metacarpi pollicis when the thumb is extended and abducted, and is practically subcutaneous at this point. With the thumb placed on the anterior surface of the wrist directly below the lower end of the radius and just medial to the tendon of the extensor brevis metacarpi pollicis the anterior surface of the bone may be palpated by direct pressure backward. With the index-finger-tip over the snuff-box and the thumb-tip in the latter position the bone can be rocked backward and forward between the fingers (Fig. 116, *a*). Such a maneuver causes considerable pain in certain normal wrists, due to pressure on a branch of the radial nerve which traverses the snuff-box diagonally and normally winds about the neck of the bone on its dorsal surface (Fig. 114). It is probable that in the normally sensitive scaphoids the nerve lies higher or lower on the flat exposed surface of bone. This tenderness may easily be mistaken for that associated with fracture. The tenderness of nerve pressure commonly lies lower in the snuff-box, is bilateral, and often radiates up the dorsolateral surface of the forearm to a point just below the elbow. It diminishes on continued pressure, whereas fracture pain tends to increase.

Tenderness of true fracture is definitely limited to the line of separation across the neck of the bone. The injured hand is grasped as in an ordinary hand clasp, thus supporting the wrist and overcoming spasm. With the index-finger of the free hand



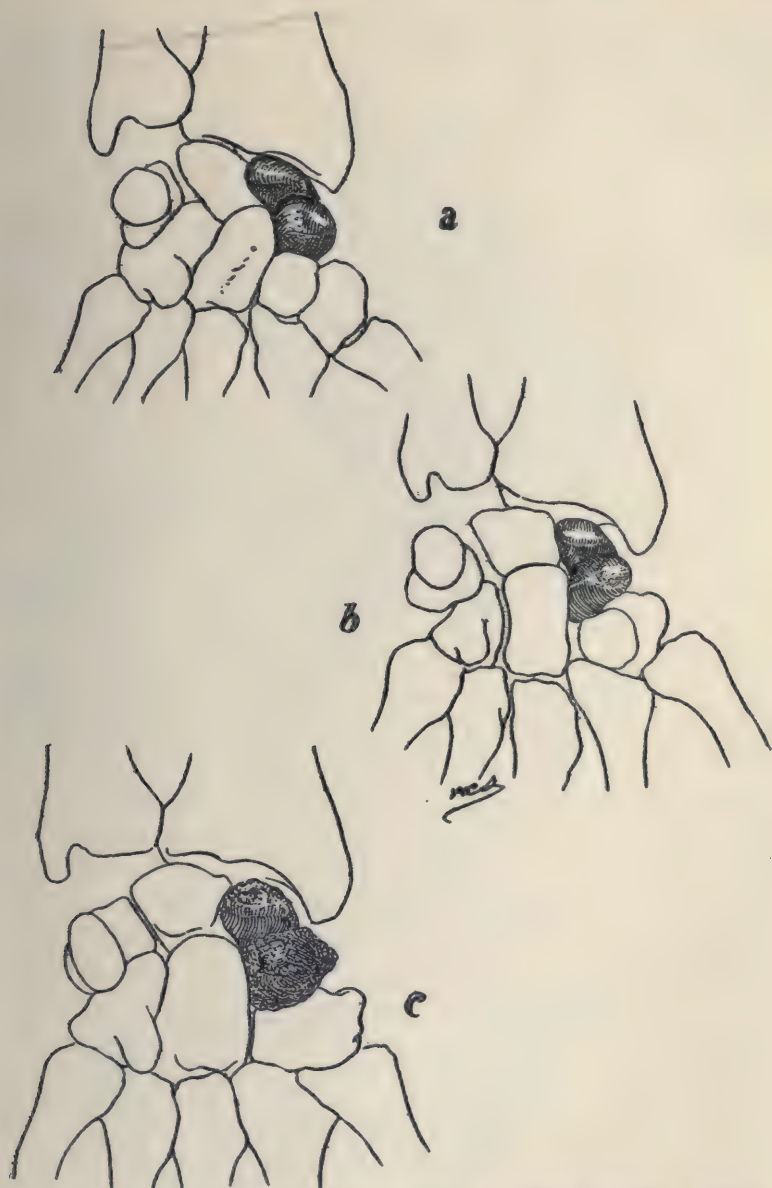
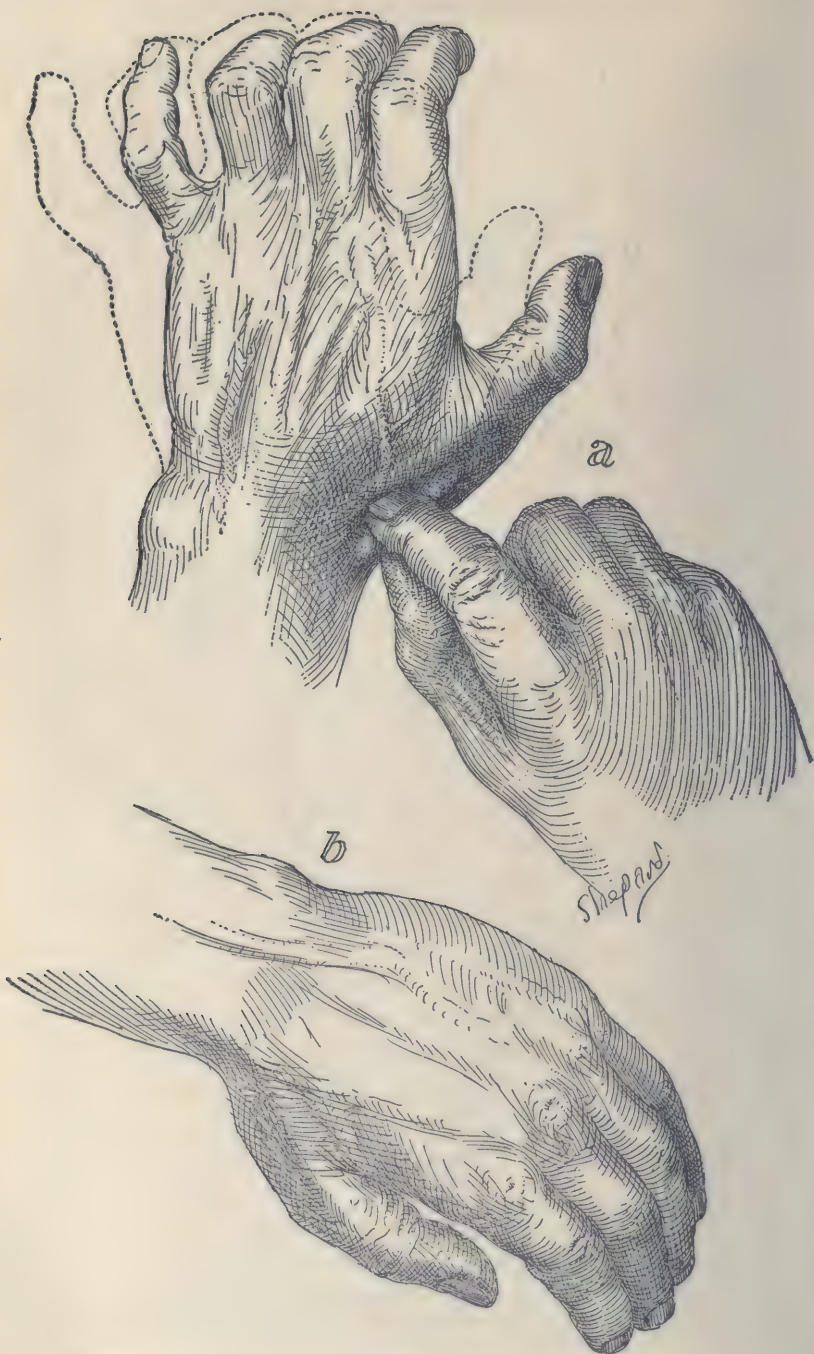


Fig. 115.—Sketches from x-ray plates illustrating different types of fracture: *a*, Old untreated fracture with crescentic bone absorption of proximal fragment; *b*, simple transverse fresh fracture; *c*, comminuted fresh fracture.



the styloid process of the radius is made out and the snuff-box is palpated with firm pressure of the finger-tip. When the site of fracture is reached pain is produced definitely enough to cause the patient to wince. This pain is more acute and definite than that accompanying simple sprain.

3. *Limitation of motion* is characteristic. Hyperextension is limited, even a slight degree causing some pain, and extreme extension causing excruciating pain. Lateral motion is limited, especially toward the ulnar side. Finger movements are unimpaired with the wrist in extension, but are somewhat limited by pain when the wrist is flexed. Gripping power is markedly diminished and certain special activities are noticeably deficient. Pushing with the extended hand against resistance, as in pushing open a swinging door, causes acute pain and weakness, as does rotary motion, such as driving a screw-driver, the lack of power occurring only with forcible pronation, not at all with supination. In other words, the individual can drive a screw in, but cannot unscrew it.

4. *Swelling* in simple fracture uncomplicated by sprain is notably slight and is limited to the dorsolateral surface of the wrist. Sprains of various degrees of severity may accompany fracture and show considerable general swelling.

As an illustration of the average case of fractured scaphoid I shall read the following report of a case seen by me several years ago.

CASE I.—Mr. P. O., aged thirty-five, architect. No previous history of injury to or weakness of wrist. Patient slipped on waxed floor and threw out left arm with hand outstretched, receiving force of blow on ball of thumb. Noted pain on motion, especially on pushing or leaning on extended hand and inability to grip tightly. Examination shortly after injury showed moderate swelling over the radial half of wrist-joint on the dorsal surface, with no evident deformity, no discoloration or ecchymosis. Radial and ulnar styloids were in normal relation.

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Fig. 116.—*a*, Method of palpating scaphoid bone; *b*, position of hand for application of plaster fixation bandgae.



Tenderness was localized to the outer third and lateral surface of the wrist below the radial articulation, and the point of maximum evincing tenderness was definitely over the snuff-box. Pain was elicited by hyperextension, adduction, and by pronation against resistance. The grip was painful and decidedly lacking in power as compared with the other hand. Finger motions were unimpaired.

*x-Ray* showed impacted transverse fracture of the scaphoid.

During convalescence callus could be felt over the site of fracture, this being due to the rather unusual amount of comminution with excess of callous formation.

Excellent anatomic and functional result after simple fixation.

*Symptoms in Old Injury.*—Old untreated or improperly treated cases of fracture show persistence of all of the signs of fresh fracture, less marked, but still definitely demonstrable. This is due to the fact that such cases rarely obtain bony or adequate fibrous union, and the upper fragment persists as an entirely articular body, loosely attached and subject to unusual mobility when extremes of motion or force are attempted. Frequently there is an accompanying persistent arthritis.

The patient complains that his wrist gives out under hard use or prolonged work of a dexterous nature, and notes especially lack of power in gripping, and pain and weakness on hyperextension, rotation, and adduction. Examination reveals tenderness over the snuff-box and a point of exquisite tenderness just below the radial styloid on the front of the wrist. Pain in the scaphoid region is produced by pressure directly upward on the ball of the thumb. Extremes of wrist motion are limited, especially extension and adduction. *x-Ray* examination shows the line of fracture, usually without any union or evidence of callus, and often with absorption of bone in the free proximal fragment, in which event the articular surface of this fragment is concave in shape.

**CASE II.**—**Mr. A. L.**, aged seventeen, student. One year ago this patient was injured in a football scrimmage, resulting in a fracture of the external condyle of the right humerus and what was considered to be a mild sprain of the left wrist. Pain and

swelling were so mild that the attention of the physician in charge was not called to the wrist injury. Since that time the wrist has been weak, and sharp pain has followed extreme motions and rotation, particularly a sudden force applied against the fingers or palm of the extended hand. The wrist gives out during gymnastic and athletic exercises where weight or strain is thrown on it, and the patient has noticed that more relief is obtained by a supporter which extends well down on the hand and up on the forearm than with the ordinary narrow wrist supporter. This is due, of course, to limitation of extension.

Examination shows limitation of extension and adduction, weak grip, weak pronation, tenderness over the snuff-box and anteriorly below the radial styloid. Such tenderness is not present in the right wrist.  $x$ -Ray reveals transverse ununited fracture without callous formation and with marked absorption of the proximal pseudo-articular surface.

**Diagnosis.**—The scaphoid lies densely surrounded by small bones, ligaments, and tendons, so that diagnosis of injury is sometimes difficult. Injury is less common than of the bones above the radiocarpal joint and more common than of the other carpal bones. Fracture occurs often in adult men, infrequently in women, and almost never in children because of the relatively late date at which ossification of the bone occurs. Ossification is usually evident by  $x$ -ray at the age of six or seven, but massing of the bone with the rest of the carpal bones is delayed until the twelfth year.

Four types of injury may cause error in diagnosis; they are, in order of frequency:

1. Injury to soft parts—sprain.
2. Injury to bone above the radiocarpal joint.
3. Injury to other carpal bones—fracture or dislocation.
4. Separation of centers of ossification in a normally ununited scaphoid.

Sprain is associated with diffuse swelling over the entire wrist, front and back, tenderness of soft parts more marked on anteroposterior than on lateral pressure, and limitation of motion in all directions.

The commonest bony injury above the radiocarpal joint is Colles' fracture, which gives rise to diffuse swelling, pain on motion, localized tenderness over the site of fracture, and on lateral rather than anteroposterior pressure. There is found also silver-fork deformity, crepitus and abnormal mobility in simple transverse fracture or shortening of the radial styloid, and bony thickening about the site of fracture, without crepitus or mobility if the fracture is impacted.

Of the other carpal bones, the semilunar alone is injured frequently enough to warrant consideration. The lesion here is an anterior dislocation alone or in association with fracture of the scaphoid. Dislocation of the proximal end of a scaphoid may readily be mistaken for a dislocated unfractured semilunar. For purposes of diagnosis anterior dislocation of the semilunar and posterior dislocation of the os magnum are classed together. Study of 118 cases of carpal injury, the diagnosis of which was confirmed in each instance by *x*-ray, revealed the following types of injury:

Uncomplicated fracture of scaphoid.....	104
Fracture of scaphoid, with dislocation of fragment.....	4
Dislocation of semilunar.....	5
Fracture of pisiform.....	2
Fracture of os magnum.....	1
Fracture of unciform.....	1
Fracture of cuneiform.....	1

Two non-traumatic lesions were encountered, a bipartate pisiform and a retarded ossification, in which latter the wrist of a woman of thirty-five showed only early centers of ossification in two bones.

Separation of the centers of ossification of a normally united scaphoid has been described from cadaver specimens, but no actual examples have been demonstrated in the uninjured wrist by *x*-ray or in the injured wrist at operation. It is safe to say that clinical signs of fresh or old injury with bony separation as shown by *x*-ray indicate pathologic fracture rather than separation of a bipartate bone.



Diagnosis of fracture, then, rests on—

1. History of a fall on the extended hand.
2. Signs of injury below the radiocarpal line:
  - (a) Pain limited to the radial half of the wrist.
  - (b) Tenderness over anatomic snuff-box.
  - (c) Limitation of motion, especially hyperextension and adduction.
  - (d) Muscular weakness, especially with rotary and gripping motion.
3. Absence of—
  - (a) Bony deformity of radius.
  - (b) Shortening of radial styloid.
  - (c) Crepitus.
  - (d) Ecchymosis or marked effusion.
  - (e) Bony deformity on anterior surface of wrist medial to tendon of extensor longus pollicis.
4. *x*-Ray—particularly stereoscopic *x*-ray—which clearly shows any misplacement of fragments.

Error in diagnosis is one of two kinds—a fracture may be overlooked or fracture may be suspected when none is present. The former is due either to entire failure to consider injury of the carpal bones or to the lack of those physical signs which might be expected to accompany bony injury. The latter is more likely to occur with old than fresh injuries.

**Treatment.**—To be effective, treatment must be applied within a few days of injury. When so applied and properly maintained the outlook for an effective wrist is good. Neglect during the first three weeks means permanent impairment. The bone is intracapsular, is constantly bathed in synovial fluid, the amount of which is increased because of the constant motion between fragments, and non-union results.

1. *Uncomplicated Fracture.*—Fixation of the wrist is all that is required in simple fracture. Moderate impaction is not manipulated, because this highly desirable condition may be thus broken up. Impacted fractures unite most rapidly and attain the best permanent result. Severe comminution may require open operation, but even in severe cases an attempt

is made first without incision. In simple transverse unimpacted fracture, the usual type of injury, we have a bone bathed in synovial fluid, with rather imperfect blood-supply and subject to constant motion. On this account bony or even solid fibrous union is slow and non-union is liable to occur. It is, therefore, necessary to immobilize the joint for a somewhat longer time than in other wrist fractures. A plaster bandage is applied from finger clefts to the upper end of the forearm, with the hand in direct line with the forearm, rather than in ulnar deflection, as in other wrist injuries (Fig. 116, *b*). The plaster is allowed to remain in place for three weeks. During the fourth week passive motion is begun, and at the end of that time the plaster is removed and a snug supporting flannel bandage is applied. So treated, the result will be a strong and supple wrist.

2. *With Dislocation of Fragments.*—Dislocation is limited to the proximal fragment which is attached most firmly in front and medially, and so becomes dislocated on to the anterior surface of the wrist medial to the tendon of the extensor brevis metacarpi pollicis. It can be palpated as a firm body lying almost subcutaneously. Reduction is accomplished by manipulation. The wrist is extended and adducted to increase the space between radius and distal fragment, and with pressure directly backward over the loose fragment the wrist is circumducted from right to left and the bone slips back into place. The plaster is then applied with the hand flexed and abducted.

The steps in reduction are:

1. Extension and adduction of hand.
2. Backward pressure with thumb over fragment.
3. Abduction of hand.
4. Flexion of hand.

In general, open operation is contraindicated in fresh fracture, as nothing is gained and much may be lost by such a course. Removal of bone relieves pain and tenderness, but undoubtedly results in more or less loss of strength in the wrist.

3. *Old Cases.*—The untreated cases present a real problem as regards treatment. Usually they show some bone absorption and new joint formation, so that there are practically two bones

instead of one. Arthritis is a common and distressing complication.

Manipulation and fixation in such cases is valueless, and only two courses remain open—to allow the patient to continue with a usable but functionally impaired wrist, or to perform open operation and remove the free fragment. The operation is simple, can be done under local anesthesia, will lay up the wrist for several weeks, and will give an ultimately good joint. It will not, however, result in a wrist of normal strength or flexibility, but will give a strong painless joint which is limited in the extremes of motion. When disability is pronounced and the hands are constantly used the benefit from relief of pain may be sufficient to warrant risking a loss of strength. In most instances pain and disability are sufficiently relieved by supporting bandage or apparatus, so that the patient declines a radical procedure.

In general, scaphoid fractures are easily diagnosed by careful clinical examination, and treatment instituted at once results in a high proportion of functionally normal wrists, whereas neglect of treatment for two or three weeks results in permanent disability. Early diagnosis, verified by *x*-ray, is therefore essential for proper and adequate treatment.





## CLINIC OF DR. VICTOR L. SCHRAGER

### COOK COUNTY HOSPITAL

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#### A SUGGESTION IN THE TECHNIC OF THE RADICAL OPERATION FOR CARCINOMA OF THE BREAST. ROUTINE APPENDECTOMY THROUGH RIGHT INDIRECT INGUINAL HERNIAL SAC IN AFEBRILE CASES. SYPHILIS OF THE LIVER SIMULATING GALL-BLADDER PATHOLOGY

#### A SUGGESTION IN THE TECHNIC FOR CARCINOMA OF BREAST

I HAVE always been impressed by the swelling of the arm and forearm which often follows radical operations for carcinoma of the breast. Various schemes and procedures have been adapted for the purpose of obviating or minimizing the edema of the arm. Dr. John B. Murphy used to interpose a flap of pectoralis muscle between the axillary vessels and nerves and the skin, thus avoiding connective-tissue pressure upon the axillary vein, which, in his opinion, was one of the chief causes of postoperative edema. While the procedure had its merits from the standpoint of plastic, it was objectionable because the pectoralis muscle could harbor carcinoma cells and subsequently be a source of recurrence. After the closure of the wound he placed the patient's arm in extension, at right angle with the body, holding it in that position by a molded plaster-of-Paris cast for a period of two or three weeks. The cases operated upon by Dr. John B. Murphy had very little or no postoperative edema.

*Editor's Note.*—In his later years it appears that Dr. Murphy abandoned the use of the plaster cast in his breast cases. In the *Surgical Clinics of Dr. John B. Murphy*, Vol. III, No. 1, February, 1914, we find the following description of the dressings following a typical operation for carcinoma of the breast:

"The arm will be dressed by the side of the body, the hand resting on the chest. A liberal dressing is applied, covering the

breast and shoulder and reaching up on to the neck. A large pad is placed in the axilla. We always remove the iodine, with

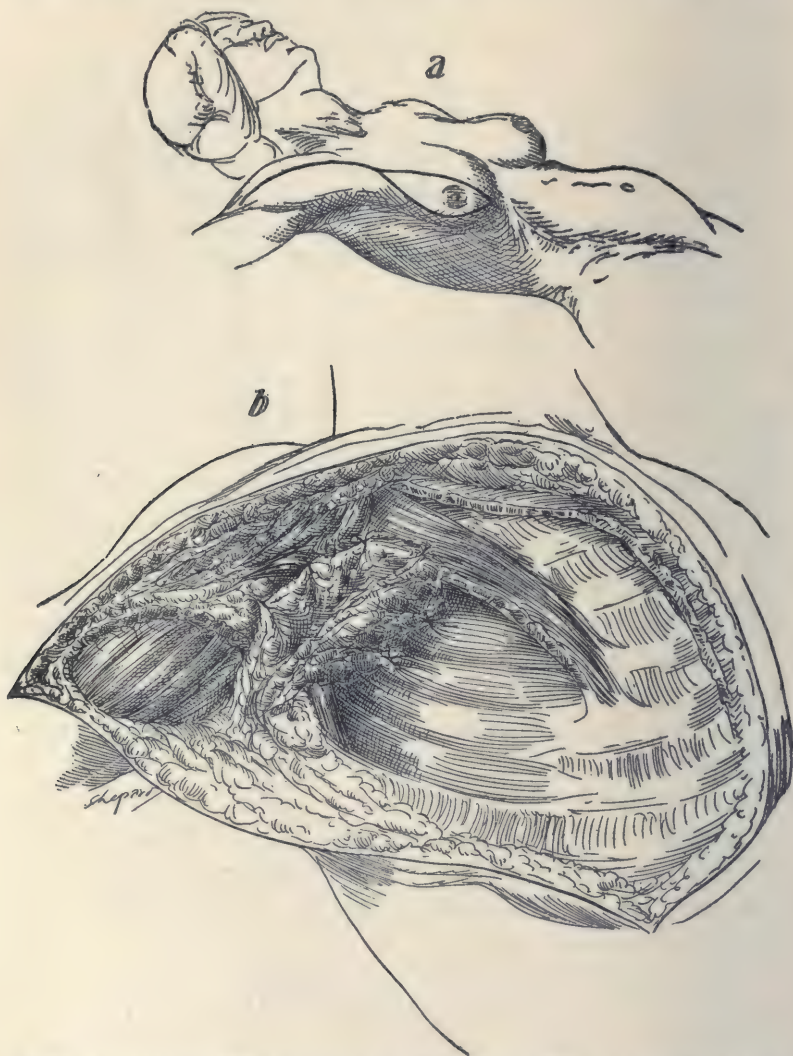


Fig. 117.—*a*, Long high incision; *b*, pedunculated flap of fat sutured over axillary vessel.

which the skin is painted before the operation is begun, with alcohol, to prevent an iodine dermatitis; then dust the wound



with bismuth subiodid powder and seal it with collodion gauze. The dressing is put on over this."

In my own work I have observed certain technical details which, in a measure, assist in reducing the postoperative edema. In the first place, I carry the pectorohumeral branch of the incision high up, 2 or 3 inches above the edge of the pectoralis major muscle, thus placing the ultimate scar above the axillary space (Fig. 117, *a*). In the last year I have employed in 3 cases a procedure which involves some of the Kondoleon principle. After finishing the operation along established lines, I dissected a good sized flap of fat overlying the biceps muscle, preserved a pedicle, and turned the fat up, placing it against the axillary space (Fig. 117, *b*). In one case I have taken three pediculated strips of deltoid muscle and turned them down into the axillary space, where they were each fastened by a catgut stitch. Pediculated strands of biceps could be equally well utilized for the purpose. The procedure is, in reality, a Kondoleon operation, utilizing, in addition, the principle of Handley's lymphangioplastic operation suggested by him in 1908, using strands of muscle instead of silk strands. Strips of fascia lata could be equally well employed. The patients operated upon by the procedures outlined above had practically no edema of the arm after the operation.

#### ROUTINE APPENDECTOMY THROUGH RIGHT INDIRECT INGUINAL HERNIAL SAC IN AFEBRILE CASES

Nine years ago I saw a patient who had all the earmarks of a localized peritonitis in the right lower quadrant of the abdomen. While the case seemed to be fairly typical of an acute perforative appendicitis, I withheld my diagnosis on account of a coincident, firm, painful, apparently strangulated hernia on the same side. The patient, a female, was operated upon, and the pathology was that of a perforated gangrenous appendix, strangulated in a femoral hernial sac. I removed the appendix, utilized the hernial sac as a drainage-tube by stitching it to the skin, and the patient made an uneventful recovery. Since that time I have had several cases in which the appendix was

very close to the base of the sac, and I removed it. In operating upon hernias at the Cook County Hospital, where the number has been very abundant, especially since the establishment of the military draft, I have had occasion to observe, in rapid succession, a good many cases of fibrous patches in the hernial sac. People who have a hernia occasionally experience pain in the region of the corresponding groin. Some discontinue their work for a few hours, or even a day or two, and then return to work continuing to experience pain in the same region for a few days thereafter. The pain is purely *local* and should be distinguished from the pain of a strangulated hernia, which, early in the condition, gives diffuse abdominal pains. In addition to this type, I believe that some painful hernias are due to an adjacent pathologic appendix. I base my assumption upon the extensive adhesions running from the appendix and caput coli to and into the hernial sac, which I have been able to observe, especially in the last eighteen months since I commenced to make a special search for this type of pathology.

I have removed a number of appendices through a right hernial sac. As a routine I do not search for the appendix in people over fifty, in patients where the procedure must necessarily be short, or in strangulated hernias. I generally introduce a Barrett, rubber-tipped forceps through the open hernial sac, and if I can grasp the cecum without effort or trauma I deliver the cecum and appendix. If, on the other hand, the delivery of the appendix requires effort or trauma, I generally abandon the attempt. If there is a distinct history of recurrent appendicitis in such a case, I do an appendectomy through a separate muscle-splitting incision.

In none of the afebrile cases in which the appendix was removed, as a routine, through the hernial sac, was the post-operative course of the cases modified or compromised by this procedure. A routine appendectomy in cases of herniotomy under local anesthesia is not desirable.

Dr. George de Tarnowsky, staff surgeon of the Cook County Hospital, now in the U. S. Army in France, was the first to suggest routine appendectomy through the hernial sac.<sup>1</sup> In his

<sup>1</sup> Jour. Amer. Med. Assoc., lxx, p. 1548.

series of 50 cases at least 30 per cent. showed evidence of a pathologic appendix. All his cases made an uneventful recovery. He does not advocate removal of an acute appendix through this route. If infection is present, as it happened in 2 of his cases, he suggests that a stab-wound be made in the abdomen by thrusting a curved forceps through the hernial sac and pressing it against the abdominal wall, opposite the point intended for drainage.

In my cases I have observed a good deal of pathology, and in several cases I have found either a subacute or acute appendix when it was scarcely suspected. The reason why these hernias were prompted to come to an operation was, in all probability, the sudden and rather severe pain in the region of the hernia, which was necessarily ascribed to it.

In removing the appendix through a hernial sac I believe that two steps in technic of routine appendectomy, which might otherwise be eliminated, should be observed here, namely, the carbolizing of the stump and the inversion of same, both of which will insure greater asepsis. The procedure has a limited application and its practice should be justified by definite pathology, ease of access, and operative skill.

#### SYPHILIS OF THE LIVER SIMULATING GALL-BLADDER PATHOLOGY

In 1912 I reported an error in diagnosis in which a strikingly typical case of gall-stones proved to be multiple gummata of the liver.<sup>1</sup> I was much relieved when I found myself in the excellent company of eminent clinicians who made and confessed in print the same error. Syphilis of the liver so closely mimics acute gall-bladder pathology that the error is quite excusable.

The history of the patient under observation was that of a woman aged twenty-seven, who complained of upper abdominal distress, paroxysmal in character, for about three years. The attacks were severe in character, occasionally associated with epigastric distress, irradiating toward the right costal arch,

<sup>1</sup> Jour. Amer. Med. Assoc., 1912, p. 681.



not necessarily related to food taking. She was often nauseated, but never vomited. The attacks recurred every three to four weeks, and required opiates at times. She did not know whether or not she had a rise of temperature during the attacks. The examination revealed definite epigastric distress on pressure and marked tenderness on perpendicular percussion below the right costal arch. The examination of stomach contents showed no retention of food after seven hours, the chemistry of the gastric contents ranging within normal limits.

The blood-picture showed a moderate secondary anemia. The x-ray showed a slight distortion of the duodenal cap, the roentgenologist concluding that it was probably due to perigastric adhesions.

In the last ten years I have observed a symptom which is always present in acute gall-bladder pathology, particularly when it concerns the cystic duct. Every case of impaction of stone or stones in cystic duct or edema of same is associated, at the height of the attack, with a very definite respiratory embarrassment. The patients complain of difficulty in catching their breath. This symptom is not present in any other acute upper abdominal condition with which cholecystitis may be confused. It was absent in this case.

The diagnosis of various physicians was either gastric or duodenal ulcer or gall-stones. An exploratory operation revealed a normal stomach and duodenum. The gall-bladder was normal except for a few adhesions toward its neck. The liver showed marked lobulations separated by thick, firm connective tissue. The surface of the larger lobulations showed grayish scars, characteristic of syphilitic hepatitis. The case showed the two types so well described by H. C. McNeil,<sup>1</sup> namely, the lobular cirrhosis and the syphilitic perihepatitis. After the operation I have learned that the patient was married twice. The first husband had syphilis and she had definite knowledge that she had contracted it. Both she and her husband were inadequately treated for a short period of time. The present husband also had syphilis, but he was very adequately treated.

<sup>1</sup> Interstate Med. Jour., vol. xxiv, 1917, p. 685.

## CLINIC OF DR. BENJAMIN F. DAVIS

### PRESBYTERIAN HOSPITAL

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#### WINGED SCAPULA—SERRATUS MAGNUS PALSY

*Summary:* Presentation of 2 cases—causes of serratus paralysis—the diagnosis; treatment—palliative in the majority of instances; operative cure attempted in selected cases by neuroplasty, costoscapular suture, or muscle transplantation.

THE condition which we are about to discuss is one which is met with not infrequently in clinical work; in the majority of instances it either yields spontaneously or functional restoration occurs through the vicarious activity of other muscles, so that the lesion requires active treatment in but a relatively small percentage of cases.

The first patient is a girl nineteen years of age, who gives the following history: About two weeks ago she fell down a flight of stairs, striking on her right shoulder. She noticed nothing more than slight soreness about the shoulder and inability to raise the right arm from the side beyond an angle of about 45 degrees. The soreness has now largely disappeared, but she is still unable to raise her arm.

Upon examination we find the young woman well nourished and in good general health. There are no abnormalities other than those discoverable upon examination about the right shoulder. We find that she cannot raise the arm, as before stated, but there is no restriction to passive motion. The deltoid appears to contract normally, as does the trapezius. The scapula, however, flares out from the plane of the back at about an angle of 45 degrees and the inferior angle of the scapula is rotated toward the midline. The examining fingers can be passed very easily beneath the scapula, so that nearly the whole of its anterior surface can be easily palpated. Owing to

the internal rotation of the inferior angle the line of the spine of the scapula is directed upward and inward rather than more or less horizontally in comparison with the normal side, and the vertebral angle of the scapula is tilted upward toward the root of the neck. When the patient attempts to raise her arm the scapula flares out from the back at approximately a right angle, and the greater the effort made to extend the arm, the more pronounced does this displacement become.

We have here a typical case of winged scapula, in this instance resulting merely from a fall on the shoulder. Before discussing the pathology of this lesion I shall present this second case, in which the etiology is entirely different, and which represents, in contrast to the first, a type of case in which nothing but operative treatment can be expected to be of any service.

This young man is twenty-one years of age. In addition to marked flaring of both scapulæ he presents marked wasting of all the muscles of the shoulder girdle, of the neck, and of the trunk. He cannot raise himself to a sitting posture from a recumbent position. The deltoid muscles, in contrast with the other muscles of the shoulder girdle, while atrophic in their anterior and posterior portions, appear hypertrophic in their medial portions. The masseter muscles also appear larger than one would expect to find them. The patient's chief complaint is that he cannot raise his arm above the level of his shoulder. It was because of this partial loss of function that he lost his position on the farm where he had been working.

This is evidently a case of progressive muscular dystrophy, and since, according to the patient's story, he has been in his present condition for over two years, it appears that the disease now is in a semiquiescent state.

With these two cases before you I shall discuss briefly the general clinical and pathologic features of winged scapula. It will be necessary to recapitulate a few of the points which have already been mentioned, but I shall try not to enlarge on them more than is necessary.

By "winged scapula" we understand that condition in which the inferior angle of the scapula flares out from the body at



approximately a right angle to the coronal plane when the arms are extended anteriorly or abducted; the condition is usually associated with inability to raise the arm on the affected side above or even to the level of the shoulder, although the patient may be able to throw the arm up above the head and to maintain it there once the position is attained. The condition may be unilateral or bilateral. The immediate cause is paralysis, sometimes involving only the upper digitations of the serratus magnus; the paralysis may be limited to the serratus or may be associated with paralysis of other muscles, particularly the lower third of the trapezius. The causes of the paralysis of the serratus magnus may be considered under several headings:

1. Trauma to the long thoracic nerve by punctured or incised wounds, or during extensive dissections in the axilla; by blows on the root of the neck, or pressure incident to carrying heavy loads on the shoulder; by pressure on the nerve due to its being caught between the coracoid process and first rib in excessive forward rotation of the shoulder, or by the repeated or long-continued contraction of the scalenus medius, as when the arms are repeatedly extended above the head against a heavy load. Repeated contractions of the scalenus medius may affect the nerve because, in a part of its course, the nerve passes through the substance of this muscle.

2. Infectious or toxic neuritis of the long thoracic, due to diphtheria, so-called la grippe, rheumatism, anterior poliomyelitis, has also been reported as a cause.

3. Hysteric. A few cases have been described in which it was suspected that the lesion was purely functional, although in the only instance which I have found in which details were given it was impossible to rule out the possible influence of coincident or preceding infectious disease.

4. Systemic disease, progressive muscular dystrophy, particularly of the juvenile type. It is in patients with this disease that the most marked instances of winged scapula appear. Here, of course, paralysis is not limited to the serratus magnus, but always involves other muscles about the shoulder-joint in proportions varying greatly in different cases.

The diagnosis is made upon the history and the results of physical examination. The patient will state that following an injury in the shoulder region, an acute infectious disease, or coming on more insidiously in conjunction with weakness of other muscles, he found that he could not bring the arm above the level of the shoulder. There is frequently no complaint of pain and the patient may not be aware that his scapula does not move in its normal plane. On examination with the arm hanging at the side one notes that the vertebral border of the scapula and particularly the inferior angle tends to approach the midline of the back. The examining fingers may easily be slipped under the scapula and the scapula be raised from the chest wall. In old cases in subjects who are not too obese palpation may reveal marked atrophy of the lower digitations of the serratus magnus. When the patient extends the arm the inferior angle of the scapula flares out from the back and may even approach or overlap the midline posteriorly. The arms cannot be extended above the level of the shoulder, and usually cannot be extended to that degree unless the patient throws them up by a swinging motion transmitted from the trunk.

The prognosis depends primarily upon the etiology. Winged scapula occurring in progressive muscular dystrophy never disappears spontaneously. Winged scapula occurring as a result of section of the long thoracic nerve is usually permanent, though in 90 per cent. of the cases functional use of the extremity is regained through the vicarious activity of the muscles of the shoulder remaining after loss of the serratus magnus. In winged scapula occurring from other causes there is almost always complete restoration of anatomic and functional integrity without special treatment, though occasionally severe contusions of the long thoracic nerve may result in permanent loss of function.

**Treatment.**—Since the majority of cases heal spontaneously, there are left but two very small groups, for which special treatment is desirable. First, those cases appearing in progressive muscular dystrophy. Here we find that while the deformity and loss of function are permanent, still either the general condition of the patient or the rapid progress of the disease, or both,

renders radical surgical intervention unjustifiable in the great majority of instances. Only occasionally a case may be presented in which the disease is very indolent or even seems to have ceased its progress, and in which the involvement of other muscles, particularly the deltoid, is but slight—these cases are fit for radical surgical intervention. Second, those cases in which winged scapula results from sectioning, rarely contusion, of the long thoracic nerve. As has been stated, in 90 per cent. of traumatic cases though paralysis of the serratus magnus and hence deformity may persist, still functional recovery occurs through the vicarious activity of neighboring muscles. In 10 per cent. deformity and loss of function are permanent unless corrected by treatment. In the vast majority of cases of winged scapula, therefore, treatment should be expectant. For the small minority there are two lines of treatment open: First, palliative, by the use of orthopedic appliances; second, operative. Of the use of orthopedic appliances there is little to be said. They may be fairly satisfactory, but tend to be heavy, and because of the necessity for frequent repair and removal too expensive for the average patient. The best and simplest appliance is one which is built upon the principle of the figure-of-8 bandage for the shoulder. Not much is to be expected from this, however, because the mere correction of the deformity without definite fixation of the scapula can in no way compensate for the loss of power in the serratus.

For the operative treatment a number of procedures have been proposed. They may be classified under three general headings: (1) Neuroplasty; (2) scapula fixation; (3) muscle transplantation.

*Neuroplasty.*—This procedure was suggested by Skillern several years ago, but has never been carried out. It is thought to be suitable for those cases in which the long thoracic has been cut or contused, and consists in anastomosing the distal end of the long thoracic with the proximal end of the short subscapular nerve. This to be done in case anastomosis between the proximal and distal ends of the long thoracic itself should prove to be impossible. The object of this operation is to restore to the



serratus magnus its normal nerve supply. This appears to be the ideal operation for a certain type of case, though technical difficulties, for instance, that of approach to the field of operation, suggest themselves.

*Scapula Fixation.*—This was first carried out by von Eiselsberg, who in 1898 reported two different operations for the cure of winged scapula in selected cases of progressive muscular dystrophy. Neither was particularly successful. The first consisted in the suture of the vertebral border of the scapula to the ribs. In this instance postoperative pain was intense and persisted far into convalescence; its severity was so great as to deter von Eiselsberg from advising the operation in other cases. In fact, he was forced to remove the silver wire sutures from this first case before healing was completed. His second method consisted in the osteoplastic suture of the inferior angle of one scapula to the corresponding angle of the opposite scapula. The results following this procedure were not satisfactory. The downward and backward displacement of the shoulders which developed because of the operation tended to occlude the space between the first rib and clavicle with serious pressure on the axillary structures. To relieve this condition a second operation was performed, which consisted in lengthening the clavicle, and was successful, but the final condition of the patient was not such as would encourage the further use of the operation. In 1912 Menciére again took up the question of costoscapular suture. He found that after careful subperiosteal exposure of three or four ribs the vertebral border of the scapula could be anchored to them without causing the patient the least subsequent pain. Menciére believed that von Eiselsberg must have included the intercostal nerves in his sutures, thus accounting for the stormy convalescence of his patient. Menciére considers the subperiosteal suture of the scapula to the ribs the operation of choice in cases of winged scapula due to progressive muscular dystrophy in which an operation is justifiable.

*Muscle Transplantation.*—Tubby in 1904 reported the case of a girl, seven years of age, who had paralysis of the serratus magnus—hence winged scapula—as a result of infantile paralysis.

As the case failed to improve with long-continued, patient, palliative treatment, the following operation was performed: Through a long U-shaped incision in the anterior axillary fold, with the convexity of the incision looking forward and downward, the sternal portion of the pectoralis major was exposed and separated from the clavicular portion and from its insertion in the humerus. With the scapula well forward the severed pectoralis was then implanted into the serratus magnus, spreading the implanted muscle out so that it was brought into contact with five or six digitations of the serratus. The result of this operation was a marked increase in functional capacity of the arm, though not full recovery, and disappearance of the deformity. Four years later Katzenstein published a modification of Tubby's operation, which consisted in the suture of the pectoralis major to the inferior angle and anterior inferior border of the scapula rather than to the paralyzed serratus magnus, and this modification has been adopted by most subsequent operators, who have followed the method of muscle transplantation in the treatment of winged scapula. This appears to be a definite improvement over the Tubby method of suture of the paralyzed serratus. It is generally recognized that paralyzed muscles and the tendons of paralyzed muscles offer poor anchorage for transplanted muscular insertions.

Various attempts have been made to fix the scapula by cutting off its inferior angle, freeing the subscapularis and infraspinatus muscles, and stitching them to the fascia of the back, but without improving the patient's condition. Such an operation was performed by me two years ago on the second case which is presented this morning, and while the patient says that he is no worse off than he was before, still the converse is also true.

On the basis of the preceding discussion we shall tell this girl that she may expect complete return of function and disappearance of deformity in the course of the next few months. It is probable that her lesion is the result of contusion of the long thoracic by pressure between the coracoid process of the scapula and the first rib due to the excessive forward rotation of her shoulder, incident to her fall down the stairway.

Owing to the marked involvement of the other muscles of the shoulder girdle, muscle transplantation is out of the question in the second case, and since this young man is able to earn his living fairly comfortably in his present condition, it is no doubt wisest to defer costocervical suture, which would be the technical procedure indicated here if active interference were to be undertaken, and advise the patient to be content with his present burden—it might easily be made heavier.



## CLINIC OF DR. WILLIAM HESSERT

ST. JOSEPH'S HOSPITAL

### UNUNITED FRACTURE OF NECK OF FEMUR—TREATMENT BY BONE TRANSPLANTATION

*Summary:* Diagnosis—fracture of neck of femur not necessarily a lesion of the aged only—functional results following fracture poor in 90 per cent. of cases; technic of bone-grafting; results in demonstrated case six months after operation.

THE history of this case is as follows:

This patient, a man of forty, was injured about two months ago by falling on a slippery sidewalk, landing on his hip. The injury was immediately disabling and he was brought home and put to bed, where he remained for six weeks. During those six weeks he was treated by his family physician, but apparently a diagnosis of fracture was not made. He was simply kept in bed and nothing further was done. After six weeks he got out of bed and went about on crutches. He was repeatedly assured that he had no fracture, although the clinical signs of fracture were obvious. In other words, when he came under our observation a few days ago he was unable to walk except by the aid of crutches, and he was suffering a great deal of pain in the right hip and in the knee. Measurement of the leg showed about  $1\frac{1}{2}$  inches of shortening. There was eversion of the foot and functional disability, and it was easy to make a clinical diagnosis of fracture of the neck of the femur. The *x*-ray picture which was taken shows a fracture of the neck of the femur, which probably at the time it was sustained was one of the base of the neck—not subcapitellar, but a fracture at the base (Fig. 118). In the last two months considerable absorption of the neck has taken place, so that at the present time the *x*-ray picture shows an osteoporosis of the head and neck, a non-union

with considerable absorption of the neck of the femur. The trochanters have slipped in an upward direction until the upper margin of the trochanter lies almost opposite the upper lip of the acetabulum. The *x*-ray confirms our diagnosis of fracture of the neck of the femur, and it is quite unnecessary in the clinical diagnosis to try to determine whether it is an intracapsular or extracapsular fracture. It does not make any difference for



Fig. 118.—Fracture of neck of femur of two months' standing. No union, with  $1\frac{1}{2}$  inches' shortening, causing great pain and total disability.

practical purposes whether the old differentiation is maintained. All we are interested in is whether it is a fracture at the base of the neck or at the head. Fractures of the head are rather more favorable because there will be less absorption of the neck and less likelihood of a non-union than in this case where the fracture occurs at the base. In fractures of the neck of the femur owing to the very limited blood-supply, the supply coming mostly through

the ligamentum teres, it is quite likely that the loose fragment is going to be devoid of the necessary blood-supply, with the result that osteoporosis and absorption of the neck will occur. But the point I make is that clinically it is unnecessary to make a diagnosis as to whether the fracture is intracapsular or extracapsular. I do not believe there are any fractures extracapsular. Some of them may be partly extracapsular and partly intracapsular, but it is unnecessary to differentiate them.

Now, we used to teach that fractures of the neck of the femur were fractures of old people almost exclusively. That is not the case. We find many, many fractures in people of adult life and middle life just as in this case—a man who is only about forty years of age, so that fractures of the neck of the femur occur not only in the aged, but they occur in the young. Of course, the aged are more predisposed to fractures of the neck of the femur owing to the fragility of the bones and the absorption of lime salts, which makes the bone less firm, with the result that very often a lesser injury is followed by fracture. They occur also between the ages of thirty and forty, and I have had one in the twenties, so it is not a fracture of the aged alone. As a general proposition these fractures will occur in old people just as well as in the young, and so the matter of non-union does not depend upon age. It depends partly on the treatment and partly on the location of the fracture. In other words, if the fracture is subcapitellar, it is more liable to result in union than in non-union. We will not have time to go into detail. There is just one more conclusion, and that is, these fractures of the hip are followed by a high percentage of disability. I think statistics show that at least 80 per cent. are followed by more or less permanent disability. In only 20 per cent. is the function any way fairly good. So you see under the most favorable circumstances the functional disability has been considerable.

Now the indication for operation here is the matter of non-union. We have a man injured two months ago with non-union, and our experience teaches us that if he has non-union in two months, he will have non-union in two years. I have a



man under observation now whom I operated two months ago for non-union that had been present two years. He had the same type of disability, pain in the hip and pain in the knee, so that the indication here is absolute, namely, to put in some sort of fixation. We have gotten away from all sorts of metallic splints, screws, nails, and spikes, because it has been shown by experience that a foreign body in the shape of metal is not conducive to good bony union. I have used spikes and I have had to take them out. The only thing to use is an autogenous bone-graft from the same individual, a peg made and driven into the previously prepared hip.

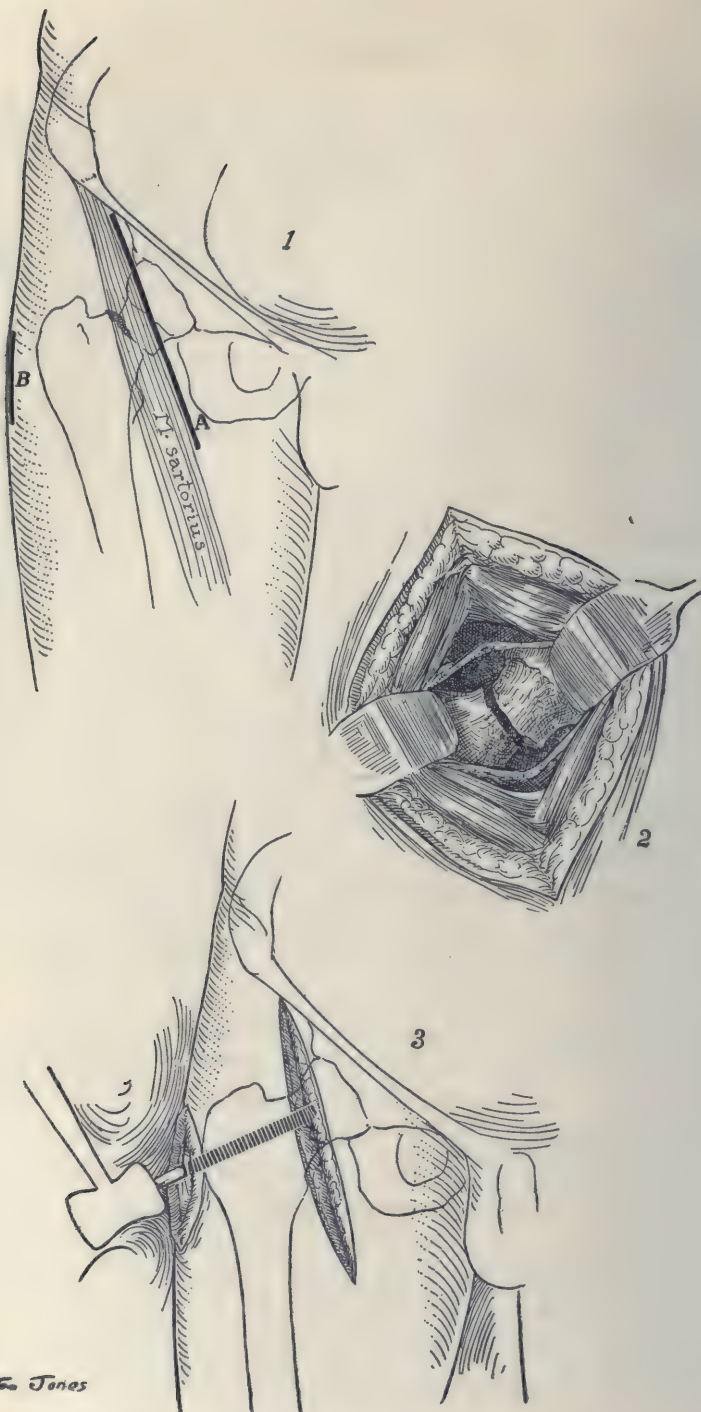
A brief resumé of what we propose to do: In the first place, we are going to make an incision on the inner side of the sartorius muscle, starting a little below the anterior superior spine of the ilium, drawing the sartorius to one side and rectus femoris to the other, exposing the hip-joint and exposing the fracture. Then we will freshen the ends of the bone. After the fracture has been exposed we will make an incision over the trochanter a few inches long, and with the electrically driven drill bore a hole through the trochanter and neck and into the head. After doing that we will expose the left tibia and take a graft 3 inches long from the left tibia, and drive it into this previously prepared drill hole in the right hip. I do not believe it will be necessary to remove the sharp corners and edges of the graft. If there is not too much pressure it is not necessary to make it round. That being done, the wound is sewed up and a plaster body cast put on. No extension is used. This cast is kept on for three months.

#### OPERATION

April 8, 1918: We will start our incision on the inner side of the sartorius (Fig. 119, 1, A). We will do this operation strictly according to the teaching of Lane. Nothing that touches the hand should go into the wound. It must be absolutely a matter of instrumentation. That is absolutely essential in the prevention of infection. We must not touch anything with the hands that goes into the wound as far as it is possible to do so. Of course, absolute asepsis is a necessity in bone work. Now

we will hold the sartorius to the outer side. Now we have exposed the capsule of the hip-joint. I will palpate with forceps. Here is the anterior inferior spine of the ilium and to the outer side is the capsule. Usually considerable bleeding is encountered when the capsule is opened. There is the rim of the acetabulum. Finally now we come right down to the head of the bone. We will enlarge the opening so as to get free exposure. Now with a knife we proceed to open the capsule. We open it as widely as we can because we want to expose it. We will not be particularly solicitous about our opening here because we do not expect to sew it up again. Now we have the fracture exposed. It seems as though there were pieces of membrane as a veil between the two fragments. The fractured surface of the upper part of the neck is bound downward, and in between this greater fragment and the lesser fragment seems to be a piece of membranous tissue which I have to cut away before I can expose the other fragment. I am now cutting away this membranous veil, and when I have finished, the fracture will be much better exposed. Now you can begin to see it (Fig. 119, 2). There is fibrous tissue interposed between the fragments. I can get a chisel in now between the fragments to pry them apart. The doctor asks me if there is any way of limiting that formation of fibrous tissue between the fragments in treating the fracture primarily. No, there is not. In all probability the man would never get a union no matter what we did.

Now I think I have succeeded in getting the ends of the bone freshened sufficiently so that we can make traction and adduction. It is very essential in these cases to correct the eversion wherever it occurs. Now we must make our incision over the trochanter (Fig. 119, 1, *B*). After having incised the periosteum we will lift it aside so as to leave the bone exposed. Here is the point where we are going to drill our hole—about  $1\frac{1}{4}$  inches below the upper margin of the greater trochanter. Now with the electric drill we will drill a hole into the trochanter and head of the bone. Here is one of the most important steps in the operation, the placing of the drill hole. It has to be so placed



*For Jones*



that when I drill through the upper end of the femur through the trochanter I will strike the neck and go into the head.

Now we will make a long elliptical incision over the tibia, and we will arrange our flap so that the skin incision will not lie right over the denuded bone. We will cut through the periosteum at the crest of the tibia and scrape the periosteum back, because we do not want any periosteum on this graft. We want the bone denuded of its periosteum, because if we had a lot of fibrous tissue adherent to the bones it would defeat our purpose. It would cover up the osteoblasts and prevent union of the graft. Now I have estimated that we will need a piece of bone about 3 inches long. With the calipers we will lay off the necessary space. In applying the saw to the crest of the tibia you want to apply it as though you were going to cut from right to left. If you apply it in the opposite direction it is liable to get mixed up with the muscle and cause trouble. We will taper the end of the graft a little with the bone-cutting forceps.

Now we have driven the graft in place and we are ready to close up (Fig. 119, 3). We will sew up the soft parts with catgut and the skin with silkworm and put on a plaster-of-Paris spica, holding the leg in abduction. This cast will be left on about six weeks, and then a new one will be applied which will be kept on for six weeks more. The patient will not be permitted to put weight on the leg for from four to six months, but he will be around on crutches in the meantime (Fig. 120).

**Postoperative History.**—Wound healing was uneventful. The first body cast was kept in place for six weeks, and it was not until then that the two subcutaneous silkworm-gut sutures were removed. The sutures had not produced the slightest

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Fig. 119.—Bone peg for repair of ununited part of femur: 1, Incisions: *a*, The anterior incision from 3 to 4 inches in length along the inner border of the sartorius muscle; *b*, the 2-inch incision over the trochanter; 2, the muscles are retracted, the capsule has been incised, and the fracture brought to view; 3, bone peg being driven home with a mallet. Preceding this last step the fragments have been reduced by traction and abduction in an extension apparatus. The bone drill has been inserted and its proper direction controlled through the anterior incision. One must not omit correction of the eversion before drilling.

irritation. A new body cast was at once applied and remained in place for another six weeks. During this time the patient was allowed up, using crutches. At the end of three months the cast was left off, and the patient walked with crutches, but no weight was borne on the fractured leg for another month. After that time, it being evident that union was firm, he began



Fig. 120.—Fracture of femur neck after operation, showing bone peg in place. The obliquity of the neck has been restored, possibly even over-corrected. Later measurement showed no shortening. The bone peg might have had more of an upward slant. Good judgment must be exercised to give the drill hole the proper direction. Without the anterior incision as a guide the operator might miss the head entirely.

to bear more and more weight on the leg, and massage and baths soon restored motion at the hip. Six months after the operation the patient was able to walk without a limp, and motion at the hip was 90 per cent. restored and not painful. There was no shortening demonstrable. There was no eversion of the foot and the patient was able to climb stairs easily. The tibia from which the graft was taken caused no trouble at any time.

## CLINIC OF DR. EDWARD L. MOORHEAD

### MERCY HOSPITAL

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## PROLAPSE OF THE UTERUS IN A VIRGIN EIGHTEEN YEARS OLD

*Summary:* Examination of patient—diagnosis; degrees of prolapse of uterus—etiology; treatment—the three cardinal principles; technic of operation in present case.

THIS young lady, Miss M. B., was brought to me last week by her mother for examination on account of a supposed swelling of the external genitalia. She gives the following history: Age eighteen years, single, born in Russia. Has been in this country three years. No special sickness during childhood, but was subject to the poor living conditions of her class in Russia. Began working when twelve years of age and work was at times quite hard for her to perform. Menstruation began when fifteen years of age, regular, but quantity small. The girl states that this swelling has been present for one year, and that at night, when she lays in bed, it disappears to a certain extent, but upon arising in the morning and walking about, it reappears, and of late has inconvenienced her so much that she spoke to her mother about it for the first time just previous to their consulting me.

Upon examination, the patient is found to be fairly well nourished, about 5 feet 3 inches in height, and weighs 98 pounds. Color is somewhat pale. Heart and lungs negative. Abdomen rather flat and so no tenderness over left side. External genitalia: The uterus protrudes about 2 inches beyond the vaginal outlet (Fig. 121). The anterior vaginal wall is involved to a small extent in the prolapse, but the posterior vaginal wall is not. Upon replacing the prolapsed uterus there is found, by bimanual examination, a mass on the left side about the size of an orange, semisolid in consistency and but slightly movable.



The diagnosis is quite evident, complete prolapse of the uterus with probably a parovarian cyst or an adherent ovarian cyst in the left side.

By prolapse of the uterus is meant a sinking or falling of that organ into the pelvic cavity and even outside of the vulva. The popular name for this condition is "falling of the womb," which



Fig. 121.—Prolapse of uterus; cervix projects about 2 inches.

may mean any of the various degrees of the displacement. The term is misleading, as a prolapse of the uterus is always associated with eversion of other structures, as the vaginal walls, the bladder, or the rectum. For practical purposes prolapse is described as occurring in one of three degrees:

1. The cervix touches the floor of the pelvis.
2. The cervix reaches the vaginal introitus.

3. The cervix passes the vaginal introitus and more or less of the whole body of the uterus is extruded beyond the vulva.

In prolapsus of the first degree the cervix touches the floor of the pelvis, the fundus uteri is proportionately below its normal level, and the uterine axis inclines slightly backward. The suspensory ligaments of the uterus, chiefly the broad ligaments, are more or less relaxed, otherwise this sinking of the organ could not take place. Neither the bladder, the rectum, nor the vagina is necessarily involved in this first degree of prolapsus. In the second degree the external os approaches the vaginal orifice, the body of the uterus is retroverted and lies in the sacral excavation, the suspensory ligaments are proportionately relaxed and drawn down, and usually the anterior vaginal wall and the posterior wall of the bladder accompany, if they do not precede, the prolapse of the uterus. The posterior vaginal wall and the rectum are as yet usually in their normal position. In the third degree the cervix protrudes from the vulva more or less, even to the extent of the entire extrusion of the uterus. The anterior vaginal wall and the posterior wall of the bladder, down to the meatus urinarius, protrude from the pelvic cavity, and in a very large proportion of cases the posterior vaginal wall and the anterior wall of the rectum are prolapsed to the same extent. The sound passed into the bladder through the urethra and the finger introduced into the rectum will at their lowest points be on a level with the external os, showing a complete prolapsus of the anterior and posterior vaginal walls with the corresponding walls of the bladder and the rectum.

Usually in prolapsus uteri of the second and third degree the organ is retroverted or retroflexed. This is due to the tendency of the organ to drop backward when its fundus falls below the excavation of the sacrum. In consequence of the downward traction of the adherent vaginal walls and a certain amount of pathologic hypertrophy of the supravaginal portion of the cervix a uterus prolapsed in the third degree is almost always elongated, frequently measuring from 4 to 6 inches in length.

There are a few instances on record in which an anteflexed

or retroflexed uterus of perfectly normal size was found prolapsed outside the vaginal orifice, surrounded by the completely prolapsed vaginal walls with bladder and rectum. These cases occurred in virgins of advanced years, in whom the natural relaxation of the pelvic connective tissue permitted a vaginal and uterine prolapse.

The causes usually given for the production of prolapse of the uterus are: First, a heavy uterus dragging down on its suspensory ligaments, and gradually sinking deeper and deeper into the pelvic cavity, until it finally draws down with it the anterior vaginal wall with the bladder and then the posterior vaginal wall with the rectum. Second, prolapse of the anterior vaginal wall with the bladder, dragging down the uterus; finally, prolapse of the posterior vaginal wall with the rectum. In the first instance it is the heavy uterus which primarily causes the prolapsus; in the second, it is the relaxed and descending vaginal walls which drag down after them the heavy uterus.

Indirect causes of prolapsus uteri are: lacerations and relaxation of the perineum and pelvic floor, whereby prolapsus of the vaginal walls is facilitated; certain constantly acting influences which force down the abdominal viscera toward the pelvic roof, such as dress, overwork, too much exercise in the erect position, constipation, and overdistended bladder. One of the commonest causes of prolapsus uteri is too frequent and too rapidly repeated parturition.

In our case today we have this condition occurring in a virgin eighteen years of age, and she states that it has existed for about one year. This is a very rare condition in one so young, and the only cause to which we can attribute its production is hard work and heavy lifting at an early age and lack of proper nourishment.

**Treatment.**—The operative treatment of prolapsus uteri must be based on three cardinal principles:

1. The diminution in size and weight of the uterus.
2. The restoration of the tone of the uterine ligaments.
3. The repair of the uterine supports, the vagina and perineum.



There have been many operations devised for this condition, and their multiplicity is an evidence of their unreliability.

Now in this patient we shall first do a high amputation of the cervix. A circular incision is made immediately above the cervix through the vaginal wall and the uterus is pulled downward with a tenaculum forceps. The vaginal wall is carefully dissected free and stripped off by gauze upon the finger, being careful to direct the force of the separation toward the uterus, thus avoiding injury to the bladder.

The amount of cervix we shall remove in this case is about  $1\frac{1}{2}$  inches. The uterine vessels on each side of the cervix are now tied as high up as possible with catgut ligatures and the cervix amputated. The vaginal wall is now sutured first anteriorly and then posteriorly, the sutures passing through first the vaginal wall, then picking up the uterine tissue, and then passing out through the mucosa of the cervical canal. I shall use three sutures anteriorly and the same posteriorly. Nothing will be done to the vagina or perineum in this case, as you readily understand that it is unnecessary.

The abdomen will now be opened in the midline between the umbilicus and the pubis. On the left side there is a parovarian cyst about the size of an orange. The broad ligament is incised and the cyst enucleated and the opening in the broad ligament closed by continuous suture. The sacro-uterine ligaments on either side are now picked up with forceps, and I shall try to place two interrupted sutures through each one of them in such a manner that when tied the ligament will be folded upon itself, thereby shortening it and elevating the uterus.

The round ligaments will be shortened by picking them up with a silk suture in either side about  $1\frac{1}{2}$  inches from the uterus. This loop is held by forceps on either side. The fascia is incised about 1 inch from the margin of the abdominal incision at its lower angle and a sharp-pointed artery forceps thrust through the fascia, muscle, and peritoneum. The loop holding the round ligament is grasped by this forceps and the round ligament pulled through the incision and sutured to the fascia. The other will be done in the same manner. The body of the

uterus now occupies practically its normal position; it is movable and the appendages have not been disturbed. The abdominal wound will be closed in the usual manner (Fig. 122).

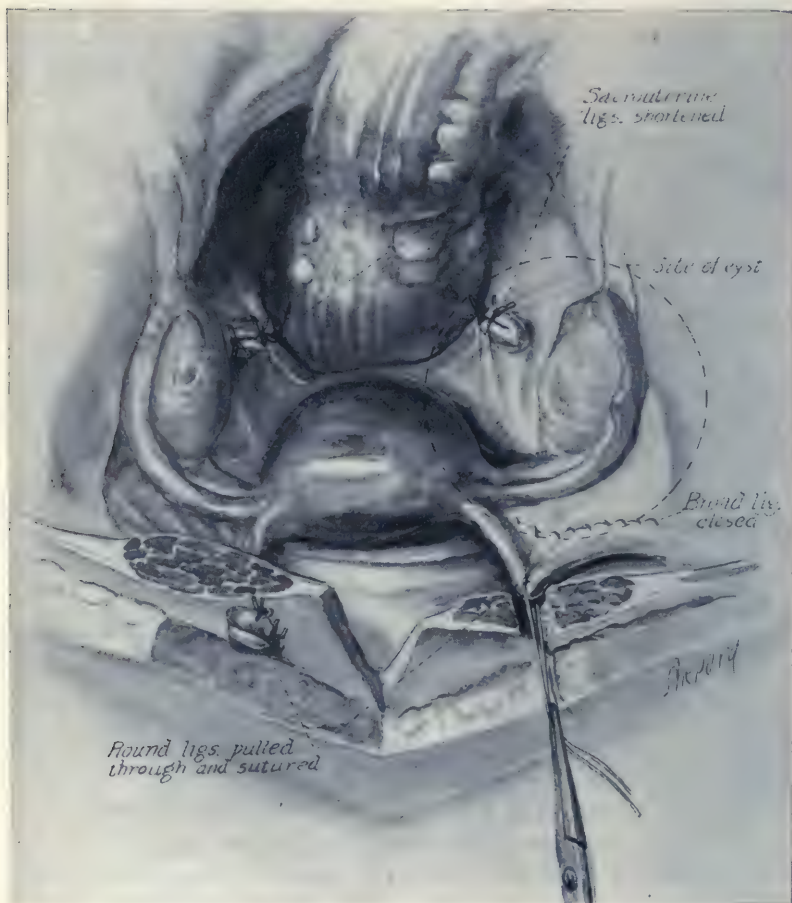


Fig. 122.—Technic of suspension of uterus to abdominal wall by round ligaments. Note site of cyst, which may have contributed in some degree to the production of the uterine prolapse.

For this young patient I think we have accomplished all that is possible, namely, reduction in the weight and size of the uterus; replacement and retention of the uterus in practically a normal position as a movable organ; preservation of the uterine appendages so that their physiologic function may be retained.

## CONGENITAL INGUINAL HERNIA

*Summary:* A baby, eight weeks of age, with a hernia which palliative treatment has failed to control—radical herniotomy.

THIS little patient, Baby H., is eight weeks old. He was brought to me ten days ago for advice regarding an inguinal hernia on the right side. His parents stated that the hernia appeared shortly after his birth and that it has been gradually increasing in size. The family doctor had tried to retain the hernia by the application of a truss, but was unsuccessful. The child was then only about six and a half weeks old, and I was adverse to any operative procedure if it could possibly be avoided, and therefore advised the doctor to continue his efforts in the application of a truss and to try that plan of support made by the use of a skein of wool, known as fingering. In this method the wool is divided at one end, so that when placed around the body the cut ends of the skein can be passed through the loop, forming a knot over the inguinal canal, which acts as the pad of a truss. The cut ends are now passed under the perineum and tied to the transverse portion behind. This can be changed daily when the child is bathed and the mother or nurse can be instructed as to its proper application. It is a very good method of treating hernia in infants where the application of the ordinary truss is troublesome or difficult.

Yesterday they informed me that their efforts were unsuccessful, that the hernia was becoming larger, and insisted that something be done for the child.

Under these conditions there is no alternative except to operate, and effect a radical cure of the hernia if possible, or at least obtain a result that will retain the hernia until the child is older and better able to stand a more protracted operation. At the present time you can readily understand it will be necessary for me to work quite rapidly, as the anesthetic must be of short duration.



The operative treatment of congenital inguinal hernia differs in no particular from other inguinal hernia, except as to the sac. The isolation of the sac may be exceedingly difficult because of its exceeding thinness, and the spreading out of the structures of the cord over a large part of the sac. Anatomically, the difference between a congenital and acquired inguinal hernia is, that in the descent of the testis into the scrotum it is accompanied or preceded by an outgrowth of the peritoneum, the processus vaginalis peritonei. This process becomes shut off, first at the internal inguinal ring, and then just above the testis, and finally the intervening portion, which remains as a fine cord-like structure within the spermatic cord. In the congenital inguinal hernia the closure of this process has failed to take place either at the abdominal ring, the testicular end, or the intervening portion, thereby leaving a complete hernial sac, which communicates above with the general peritoneal cavity.

The usual incision is made for inguinal hernia, and I shall try to isolate the sac first at the external abdominal ring as the landmarks there will be better. This we are able to do, and the structures of the cord are dissected from the sac. Upon opening the sac and exposing its contents there is found, besides the intestine, the appendix prolapsed with its mesentericulum. No attempt will be made to remove the appendix, as time is a great factor in this special case. The contents of the hernial sac are now reduced and the sac may be dealt with in one of three ways: First, by ligation at the internal inguinal ring, everting and suturing the remainder. Second, by ligation at the internal inguinal ring, cut off and sutured at the testicular end, forming a new tunica vaginalis, and removing the intervening portion. Third, ligation at the internal inguinal ring, and the dissecting away of the remaining portion as far as its attachment to the testis, without constructing a new tunica vaginalis. The last method is followed in this case, and the operation completed in the usual manner. There has been very little anesthetic used and the little fellow is in good condition, and I believe the prognosis is good from an operative and curative standpoint.

## STRANGULATED INGUINAL HERNIA COMPLICATED BY ACUTE GANGRENOUS APPENDICITIS

*Summary:* History and diagnosis—Andrews' operation for the radical cure of hernia.

THIS patient is a male, aged fifty-eight years. He gives a history of having had an inguinal hernia on the right side for a number of years. He has worn a truss and never had any difficulty in replacing and retaining the hernia. General health has always been good. Drinks moderately. No venereal history. Bowels regular. Appetite good. Occupation, laborer. He says that last Friday evening he did not feel very well, that he had an uncomfortable feeling in the abdomen, was nauseated, and did not eat any supper. During the night the pain increased and by Saturday morning it was severe and accompanied by vomiting. He was unable to retain anything in his stomach all day Saturday and Sunday. Bowels did not move Saturday or Sunday. The hernia came down early Saturday morning when the vomiting began, there was severe pain in it, and he was unable to reduce it. A physician was called and attempted to reduce the hernia, but failed, and advised his removal to a hospital for operation.

Patient was admitted to Mercy Hospital Sunday afternoon at 3 o'clock, about thirty-six hours after the onset. At that time his temperature was 102° F., pulse 120. He was nauseated and suffering from severe pain. The hernial protrusion was larger than a fist and irreducible.

Diagnosis, strangulated inguinal hernia.

He was immediately prepared for operation. Ether anesthesia. The operation which was performed in this case (Andrews' operation) is the one I usually follow, as I believe it to be the best, because by it the buttress overlying the weak part of the abdominal wall is made up not merely of muscle, but also of one of the strongest structures, the aponeurosis of the external oblique muscle.

The skin incision, about  $3\frac{1}{2}$  inches in length, was made not quite parallel with Poupart's ligament, but slightly vertical, so as to be parallel with the fibers of the aponeurosis of the external oblique muscle. The aponeurosis of the external oblique muscle was then incised in the direction of its fibers through the external ring. The upper flap was not dissected away from the underlying internal oblique muscle; the lower flap was retracted and the cord lifted away. By gauze dissection as much of Poupart's ligament was exposed as was necessary. The cremaster muscle and cremasteric fascia were now incised, the cord lifted up, and the sac isolated. In oblique inguinal hernia the sac is always to the inner side of the cord. In old hernia the sac is usually thickened and is recognized by its pale color. The sac was opened. In this case the bowel was strangulated, dark in color, and there was free fluid in the sac. Upon lifting up the first coil of intestine there came into view the gangrenous vermiform appendix (Fig. 123). The bowel was treated by the application of hot compresses until the color improved; the appendix was removed by ligation and inversion with a purse-string suture. The contents of the hernia were now reduced and the neck of the sac ligated high up with catgut by transfixion, the redundant portion of the sac amputated, and the stump allowed to slip back into the peritoneal cavity. The cord was now replaced in its bed, and the closure made by sutures of kangaroo tendon. On the upper side each suture includes the aponeurosis of the external oblique and the united internal oblique and the transversalis muscle; lower down the suture includes the aponeurosis of the external oblique and the conjoined tendon, and further toward the median line the aponeurosis of the external oblique and the edge of the sheath of the rectus muscle. Upon the lower side all the sutures are inserted so as to take a firm bite on the shelving edge of Poupart's ligament. A sufficient number of sutures are taken, so that, when tied, the entire inguinal canal is closed, leaving at the lower angle enough room for the escape of the cord without strangulating it. The overlappning of the aponeurosis of the external oblique is now made by sutures of chromicized catgut,



each suture grasping, on the upper side, the anterior surface of the aponeurosis of the external oblique, and on the other side the cut edge of the lower flap of the aponeurosis. When these sutures are tied the lower flap overlaps the upper throughout



Fig. 123.—Sac laid open, disclosing strangulated bowel and gangrenous appendix.

its entire length. The skin was closed with interrupted silk-worm-gut sutures. Usual dressing. The postoperative course of this case to date has been uneventful. The wound is perfectly clean. The external sutures will be removed on the tenth day.



## INFANTILISM

*Summary:* Demonstration of patient—the diagnosis—its definition; etiology.

I BRING this patient into clinic this morning, not because of the condition for which she sought relief upon admission to the hospital, but because of the very interesting picture she presents. Mrs. A. R. is twenty-six years old and enters the hospital because of a reddened, painful swelling, indurated and firm, at the site of the right Bartholin gland. A history of vaginal discharge and burning on urination precedes the appearance of this condition by several days. Upon examination this tumor mass was found to be a Bartholinitis, probably gonorrheal in origin. This condition was treated, and now I bring the patient in that you may observe her.

As you see, her body is apparently well formed and she walks without assistance (Fig. 124). By actual measurement she is 45 inches in height. Physical examination reveals a very small white woman, apparently older in years than her size would indicate. The expression on the face is old and many of the teeth are missing. The scalp, eyes, and nose are negative. In the neck many small superficial lymph-glands are palpable, but the thyroid cannot be made out. General examination is otherwise negative, with the following exceptions: The body appears about the size of that of a girl eleven years old. The breasts are not developed. There is no axillary or pubic hair and the external genitalia are infantile in type. A very small rudimentary cervix is felt in good position upon vaginal examination and a rudimentary corpus above it.

The patient states that she has always been small for her age and has not grown any since she was fifteen years old. Menstruation has never appeared and, though the patient has been married for seven years, she has never become pregnant. She has never felt very strong and tires easily while at work. Family history negative; no other members of her family are so affected.



Wassermann test is negative. Past history is negative for injuries or acute febrile diseases of childhood.

Our diagnosis is evident—a case of infantilism. This term is a rather uncertain one, but briefly we may define a pure infantilism as a standing still at the infantile stages of development, considering especially the following factors: the genitalia



Fig. 124.—Case of infantilism. Note absence of the usual development of the female breasts.

and the *vita sexualis* remain undeveloped or develop deficiently; and the same is true of the secondary sex characters; the involution of the lymphatic apparatus is deficient, the growth is deficient; ossification, that is, the appearance of the bone nuclei and the closure of the epiphyses, is delayed, and the childish dimensions of the body are retained wholly or in part

—that is, the lower length of the body equals the upper length or, what is commoner, exceeds it only a little—the form of the pelvis is neither of the masculine nor feminine type, but infantile; and finally, the psyche remains behind in development. Such individuals show throughout no gross defect in intelligence, but their minds remain childish.

Important for the definition of infantilism are the following considerations, which serve to render precise the position of the ductless glandular system in the pathogenesis of infantilism: If the infantilism comes about through a standstill of the entire organism at a childish stage of development, then it is intelligible that also the sexual glands do not develop further. Up to the present, however, we have not sufficiently considered that the sexual glands occupy a separate position in the ductless glandular system, in that, though they function from early youth and influence the development of the organism, yet they attain their complete maturity only at the age of puberty; the other ductless glands are already fully developed in the newborn. At the same time the remaining behind of the development of the sexual glands in infantilism is only a subordinate symptom of the entire clinical picture.

The case is shown only for the features it presents, as the question of treatment involves not a cure of the condition, but aims only to aid in substituting for the functions of some of the glands of internal secretion. By the use of this method we can hope to make the patient more comfortable and probably increase her strength so that she may more satisfactorily discharge the duties of her daily life.





## CLINIC OF DR. G. L. McWHORTER

### PRESBYTERIAN HOSPITAL

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#### DIAGNOSIS OF FISTULA IN ANO

*Summary:* Necessity of proctoscopic examination; technic of proctoscopy; importance of finding the internal mouth of the fistula—*injection of methylene-blue solution as a guide.*

FISTULA in ano, though a common complication, is often neglected for fear of a disagreeable result, incontinence, and for fear that operation may result in failure to cure. Tuttle has stated that less than 45 per cent. of fistulæ out of a series of 2196 cases treated were claimed to be cured. The reasons for the large percentage of failures are, chiefly, failure to find the internal opening, overlooked pockets or collaterals, failure to remove the predisposing cause, as, for example, a pocket in a sinus of Morgagni, hemorrhoids or a prolapse, and, lastly, neglect in dressings.

Fistula in ano may be complete or incomplete. In the complete type one opening is through the skin, adjacent organ, or bowel. The other opening is in the mucosa of the rectum. In the incomplete or blind type the opening may be internal, in the rectum, or external on the skin. There are three distinct relations to the muscles: in the first, the tract lies superficial; in the second, it lies in the ischiorectal fossa with the internal opening between the internal and external sphincters; in the third, the internal opening lies above the internal sphincter. In this last relation, while the internal opening may be higher in the rectum than the internal sphincter, yet in many cases the tract is superficial to the sphincter, and consequently it is unnecessary to cut it. Where the tract extends high into the ischiorectal fossa some source in the pelvis should be considered, such as inflammation of the pelvic organs and bones.

The usual cause of fistula in ano is a periproctal abscess which has been neglected, and after breaking open has formed a fistula which rarely heals by itself. The infection may be pyemic or due to tuberculosis or syphilis. In syphilis it may follow ulceration of the rectum. Various authors report from a low to a high percentage of fistulæ in ano due to tuberculosis. The tubercle bacilli may gain entrance from being swallowed by a

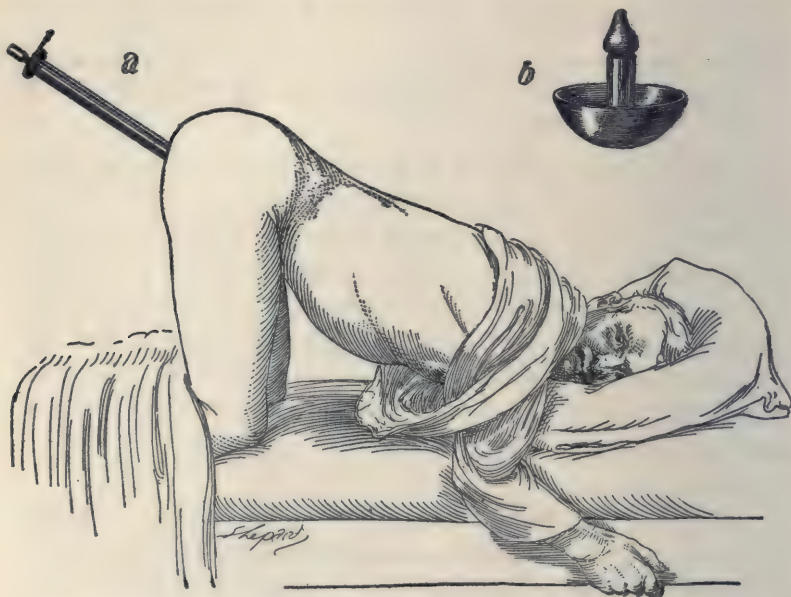


Fig. 125.—*a*, Knee-chest position for examination. The proctoscope is passed with the axis in line with the anal canal, and then its position changed to follow the rectum and sigmoid; *b*, the Wheeler rubber tip which is attached to a syringe for injection of the fistulous tracts.

patient with pulmonary involvement, or they may be derived from the food, the rectal symptoms being the first to appear.

In order to locate the openings and tracts before operation the proctoscope is necessary, and in order to rule out pelvic sources the use of bismuth, thorium, potassium iodid, or some other media with the Roentgen ray is advisable. I have found it especially valuable to proctoscope the patient and, after examining the lower sigmoid and rectum, to determine the position

of the opening by observation, especially after injecting methylene-blue solution. I had difficulty in introducing solutions into these sinuses until I used the Wheeler tip on the end of a syringe (Fig. 125, *b*). This is of rubber, bluntly pointed, yet the very tip may be inserted into the smaller openings, and, being slightly flexible, it follows the sinus while pressure is made to force solutions into the fistula. The broad part of the tip effectually fills the mouth of the tract. By carefully withdrawing the proctoscope, the one or more internal openings may be seen, and their positions located. Roentgenograms may be taken if desired. The importance of localizing these internal openings before operation and this very satisfactory manner of injecting the tract are emphasized.

The discovery of branches with multiple openings is practically impossible at the operation on account of the blood-stained field. The procedure of passing a probe through the tissues from the external opening until felt under the mucous membrane, then pushed through to complete the sinus, should be condemned, for following this method a blind internal opening is often left higher up or even on the opposite side of the bowel.

### TECHNIC OF PROCTOSCOPY

The proctoscope most satisfactory for inspection is the 25-cm. length, having a large observation lumen. The Tuttle instrument which I am using has the stem for carrying the electric light in a groove external to the lumen (Fig. 126). At the extreme end this small cylinder is closed by a flint glass bulb. Instruments are made in various sizes and lengths. An obturator is provided for introduction. Upon removing this, a glass window is inserted and connected with a hand-bulb for inflation.

The patient is prepared for examination by a cathartic at night and by a thorough flushing of the colon in the morning. There should be no fluid in the sigmoid or rectum at examination. The preferable position for routine examination is the knee-chest. All waist bands are removed and clothing loosened. The thighs should be practically vertical, the chest in contact



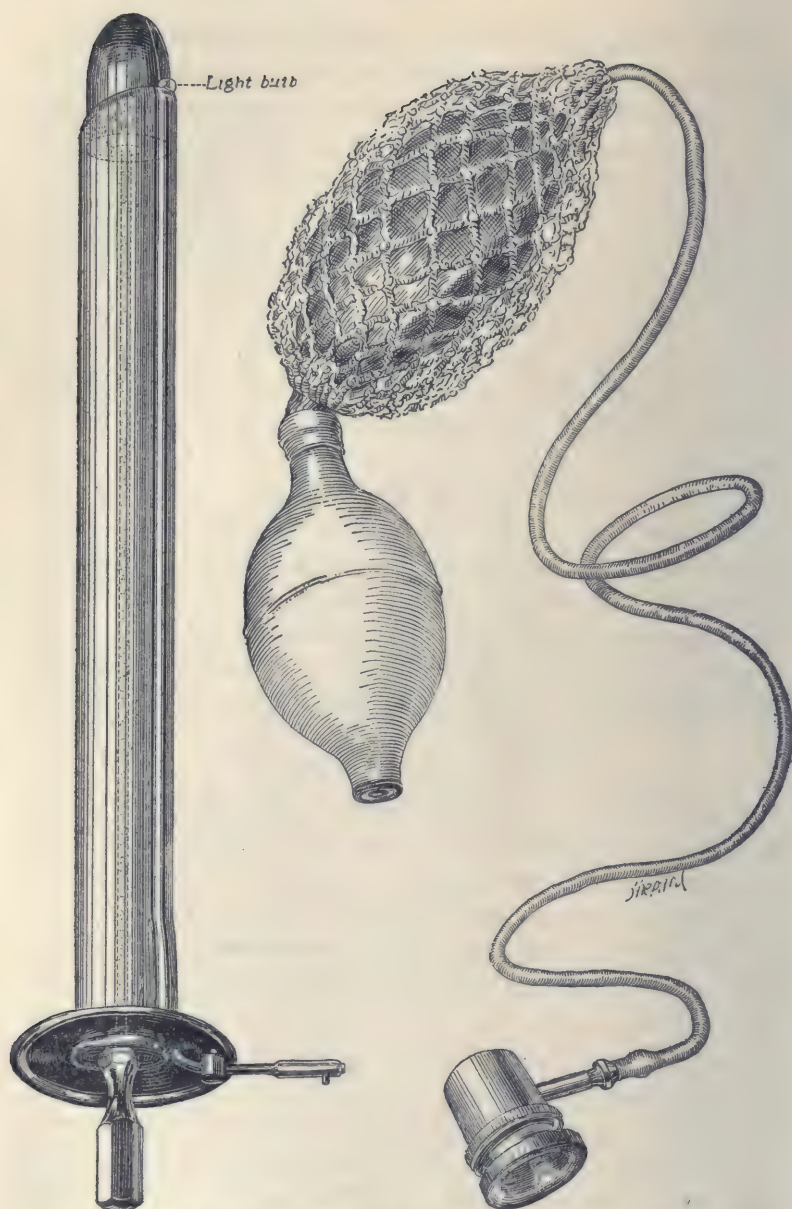


Fig. 126.—The proctoscope ready for insertion, and hand bulb for inflation. Cautious inflation is practically free from danger and aids introduction of the instrument and observation.

with the examining table, the head turned to one side with the face against a thin pillow, and the arms extended. In this position the patient should be told to breathe through his mouth and to relax, so as to produce as much of a lordosis as possible (Fig. 125, *a*). This position empties the pelvis of intestines, relieves the pressure from adjoining organs on the rectum, and permits the rectum to balloon out when air is allowed to enter the anus.

Before instrumentation, always make a digital examination in order to determine abnormalities, such as stricture or a new growth in the lower rectum, and changes in the ischiorectal fossæ. This not only gives one information of the terminal rectum, but prevents blindly introducing an instrument and possibly injuring tissues. The instrument is lubricated, carefully introduced with the axis directed at first downward and forward in the direction of the anal canal. After the end passes the sphincters into the rectum the obturator is removed and air is allowed to enter the rectum. It may be necessary to further distend the rectum, in which case the window is inserted and the hand-bulb used.

On examining the rectum the axis of the proctoscope is changed and directed upward, then, gradually changing to pass the pelvic brim, the sigmoid is inspected. Crescentic folds or valves of Houston, usually three in number, are seen extending part way around the rectum. The middle valve is usually the most prominent and is located on the right anterior quadrant of the rectal wall, usually just below the level of the pouch of Douglas. The inferior valve is about 3 cm. above the anal canal on the left posterior quadrant. The superior valve is in the same quadrant. There is usually a well-developed valve or sphincter at the rectosigmoid juncture.

The sigmoid does not balloon out with the rectum, and since the rectosigmoid juncture is usually on one side, the rectum may seem to end in a blind pocket. This necessitates withdrawing the proctoscope slightly and searching for the opening. Though the rectosigmoid juncture may be to the right or left, I have found it more frequently upon the left. The proctoscope

now is gradually withdrawn, and at the same time the methylene-blue solution is injected into the external opening of the fistula; if there is more than one opening, the others are temporarily closed. The internal openings are located by the escape of the blue solution from them as the proctoscope is being withdrawn, keeping the rectum and later the anal canal distended with air by use of the hand-bulb. Blind internal tracts are located through a short proctoscope by means of a probe with the tip bent upon itself, by inspection of the small papillæ, and by expressing pus on pressure.

In the treatment of fistula in ano the general surgical principle rests upon the division of the tissue between the fistula and the anal canal. This converts the fistula into an open gutter which may heal by granulation from the bottom. It is rarely necessary to cut both sphincters, and in these cases the conservative gradual division of the fistulous tracts as advocated by Albright should be considered. If necessary to cut the external sphincter in more than one place, it should be done at a second operation. Care should be taken to cut through the sphincter muscle-fibers at right angles and not obliquely. The superficial fibers of the external sphincter run almost parallel, fusing in the midline in front of and behind the anus, but the deep, thicker mass is circular. In horseshoe fistula, with multiple openings, an encircling cut is made in the skin and only one cut through the sphincter. If excision of a fistulous tract is practised it may be unnecessary to cut the muscle. Pelvic fistulæ should not be operated in this manner, but treatment should be directed to the cause.



## CLINIC OF DR. DANIEL N. EISENDRATH

### COOK COUNTY HOSPITAL

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#### FRACTURES OF THE PATELLA

*Summary:* A case of fracture of the patella with wide separation of the fragments—operation within forty-eight hours after injury; pathology and surgical anatomy of fractured patella; advantage of early operation.

THE case which I wish to present to you today is one of a laborer aged forty, who entered the hospital after a fall upon the sidewalk which resulted in the fracture of his left patella. He was unable to walk immediately after the accident, a symptom which I consider of great importance, and which is due not so much to the fracture of the patella itself as to the tearing of the aponeurosis on either side of the patella. He entered the hospital with an enormous swelling of the knee-joint, the result of an extensive extravasation of blood not only into the joint proper but also surrounding the fractured surfaces of the patella and the torn edges of the aponeurosis. It is of considerable interest in this case to note the fact that the patient had a fracture of the same patella thirteen years ago and was treated in this hospital for ten weeks by non-operative measures. Therefore we are dealing with a so-called refracture, which is not infrequent in the case of this particular bone. Such a refracture is much less apt to occur in cases which have been operated upon, because we make a special effort, as we shall see later, to prevent inversion of the periosteum between the fractured surfaces. I believe that the removal or lifting up of the periosteum covering the fractured surfaces and the suture of the torn aponeurosis are the two chief advantages of the operative treatment.

The examination today shows a wide separation of the two fragments into which the patella has been divided by the trans-

verse line of fracture. The diastasis is wide enough to admit three fingers easily. The x-ray confirms the transverse nature

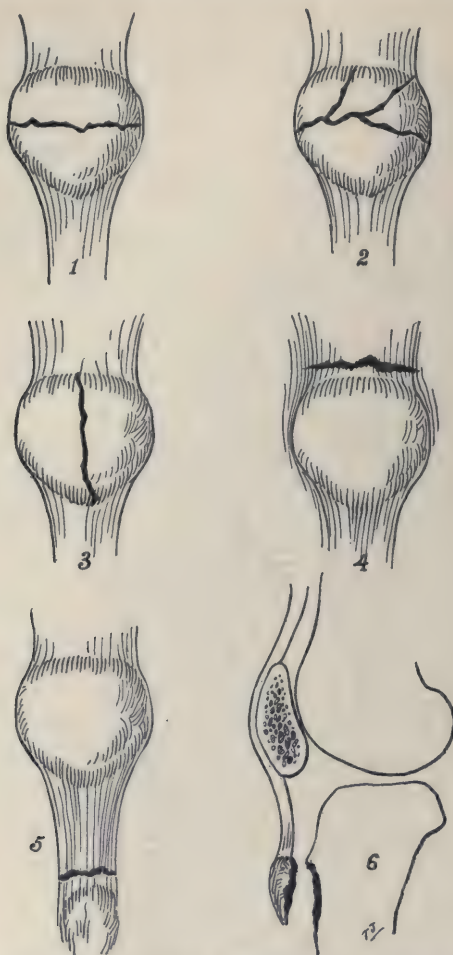


Fig. 127.—Various traumatic conditions of patella and its vicinity: 1, Transverse fracture of patella; 2, stellate fracture of patella; 3, longitudinal fracture of patella; 4, transverse laceration of aponeurosis just above patella; 5, laceration of ligamentum patella; 6, tearing off of tubercle of tibia.

of the fracture and the wide separation of the fragments. It is necessary in these cases to take both an anteroposterior and a lateral view, because not all fractures are of the transverse

variety. Figure 127 illustrates some of the most frequent injuries of the patella and of the structures immediately adjacent thereto. In the examination of some of these the  $x$ -ray is of great value, but in others we can only make the diagnosis by finding the patella itself intact or by demonstrating the patient's inability to extend the leg. A glance at this diagram will show you that we may have transverse, stellate, or even longitudinal fractures of the patella.<sup>1</sup>

The conditions which may simulate fracture of the patella having in common the symptom of inability to extend the knee and of swelling of the knee-joint following trauma are: (a) Rupture of the aponeurosis of the quadriceps extensor just above the patella; (b) laceration of the ligamentum patellæ itself; (3) evulsion of the tubercle of the tibia. The last-named condition can be easily differentiated from fracture of the patella by the fact that the point of maximum pain is over the head of the tibia, there is less apt to be much swelling of the knee-joint, and a lateral  $x$ -ray view will show the condition. At times one can demonstrate preternatural mobility at the point of the insertion of the ligamentum patellæ into the tibia. In the case of a laceration of the ligamentum patellæ we find the patella intact, but palpation will reveal a gap when the knee is flexed at a point between the patella itself and the tubercle of the tibia. Finally, in case of laceration of the quadriceps aponeurosis above the patella, the patella remains intact, but a gap should be demonstrable above the patella when the patient makes an effort to extend the knee or when the latter is forcibly flexed.

In some cases of fracture of the patella, as in the patient on whom we are to operate today, the diagnosis is easy, because one can feel a space between the fragments and can manipulate them separately from side to side—a very important fact. I recently encountered a case in which it was necessary to resort to the aid of the  $x$ -ray in order to exclude fracture. There was a condition somewhat similar to that occasionally found

<sup>1</sup> Hessert recently described a case of longitudinal fracture of the patella in the Surgical Clinics of Chicago, August, 1918, p. 849.



beneath the pericranium after trauma, namely, a hematoma which, becoming partly organized, produces a lesion with a soft center and a raised, hard margin, simulating depressed fracture very closely. In this instance the organizing clot on the anterior surface of the patella produced a transverse groove on



Fig. 128.—Fracture of patella with wide separation of fragments. In spite of the latter condition the patient had excellent use of the limb and extension was perfect.

the patella which on palpation could not be differentiated from a transverse fracture.

For many years the fracture of the patella itself was considered the most important feature. The increasing number of operations for fracture of the patella and observations on non-

operated cases have taught us that the power of extension of the knee may be practically perfect even though there be a wide separation of the fragments. Figure 128 is an x-ray print from a case which I have recently seen in which there was a space nearly 3 inches in width between the two fragments following a fracture of the patella ten years ago, but with very little tearing of the lateral aponeurosis. The patient had not been operated upon, and yet today the power of extension is practically perfect, and there is only a slight limp, and the presence of a space between the two fragments of the patella to indicate that there has ever been a fracture of this bone. This case emphasizes a point which I am trying to bring out, namely, that the patella itself is practically a sesamoid bone, and it can be completely removed without interfering with the extension of the knee-joint.

Observations of operated and non-operated cases of fracture of the patella has clearly demonstrated the fact that the chief advantage of the operative treatment is to establish a firm union of the torn lateral aponeurosis. The principal conditions which are encountered in fracture of the patella are well illustrated in Fig. 127. They are: (a) Effusion of blood into all portions of the joint. The blood-clots separate not only the fractured fragments themselves but also the surfaces of the torn aponeurosis; (b) an inversion of the periosteum, so that it completely covers the fractured surfaces and prevents accurate union of the fragments; (c) a transverse tear of the aponeurosis and of the capsule of the joint.

The lateral portion of the aponeurosis is the chief factor in extension of the knee. It has a firm hold on the patella because it fuses with the periosteal covering of the patella when it reaches the edges of that bone. In the treatment of this condition I do not doubt but that fairly satisfactory results can be secured by non-operative methods, but in view of the fact that our knowledge of the pathology of fracture of the patella has been cleared up by frequent operations, I cannot see why a case should be treated by a non-operative method if a capable surgeon versed in the details of modern bone surgery and aided by proper

surroundings can be secured. You must understand that the best we can hope for by the operative and non-operative methods is a fibrous union of the patella. As I have stated previously, those who advocate non-operative treatment overlook the essential fact that the tearing of the lateral aponeurosis is far more important for the future usefulness of the knee than the fracture of the patella itself. An accurate approximation of the torn surfaces of the aponeurosis, you will grant, can be secured better by open operation than by merely attempting to approximate the fractured fragments. Another great advantage of the operative method, as we shall see later, is the ability to secure active mobilization of the joint at a much earlier period than is possible with the non-operative methods, which require at least six weeks of fixation. It is my own practice to begin both active and passive movements of the knee-joint within ten days after operation, and I know of surgeons who are even more radical and begin as early as the third or fourth day. You can understand the great importance of this early mobilization when I state a fact you have probably frequently observed, namely, that a fibrous ankylosis of the knee-joint is more difficult to overcome than that of almost any other joint in the body.

Now, as to the time of operation, some of our surgeons advocate waiting for ten to fourteen days after injury. Their argument is that by this time the process of immuzination against infection has taken place in the vicinity of such an injury. Infection is much less likely to occur at this time than when the case is operated upon at an earlier period. There may be an element of truth in this argument, but my own experience and that of many other surgeons has led me to believe that there is practically no difference from the standpoint of liability to infection between a case operated upon within the first few days and one operated ten to fourteen days after injury. The observations of those surgeons who believe in delaying operation is of value, however, in demonstrating the fact that we can safely wait until a later period and secure good results. At times the abrasions of the skin in the vicinity of the knee-joint



are so extensive that it is advisable not to operate until all chances of infection from these superficial injuries has been eliminated. This is especially true of cases which have not been seen by surgeons until two or three days after the accident.

In accordance with my own belief in regard to early operations, we shall proceed to perform an operation upon this case today, forty-eight hours after the accident. The question of the preparation of the skin requires no special comment, as it is pretty well standardized. Personally, I prefer two coats of  $3\frac{1}{2}$  per cent. tincture of iodine applied from the hip-joint to the level of the ankles, that is, well away from the operative field. In regard to the incision, nearly every surgeon has his preference. One employs a U-shaped incision with the convexity upward, another with the convexity downward, and others employ a transverse incision. I do not believe that this is a very important point, because the wound will heal as well with one form of incision as with another, and there is just as much danger of tension upon the edges of the wound during active mobilization with one incision as with the other. Personally, I prefer a transverse incision, which we will use in this case.

Having made this incision from a point over the external condyle of the femur to a similar point over the internal condyle in order to secure a wide exposure of the lateral aponeurosis, we shall proceed to utilize the principles of the Lane technic—that is, to permit the gloved fingers to come in contact with the wound surfaces as little as possible. I am now able to demonstrate the three principal pathologic factors in fracture of the patella, namely, the turning in of the periosteum over the fractured surfaces, a wide tear of the lateral aponeurosis on either side of the patella, and an extensive extravasation of blood both into the tissues in front of the patella and into the joint proper.

The first step consists in reflecting the periosteal-aponeurotic covering by lifting it up from between the fractured surfaces of the patella, so that the flap can be utilized later for the purpose of approximation. The two fragments of the patella can be seen to be widely separated and can be moved laterally in-

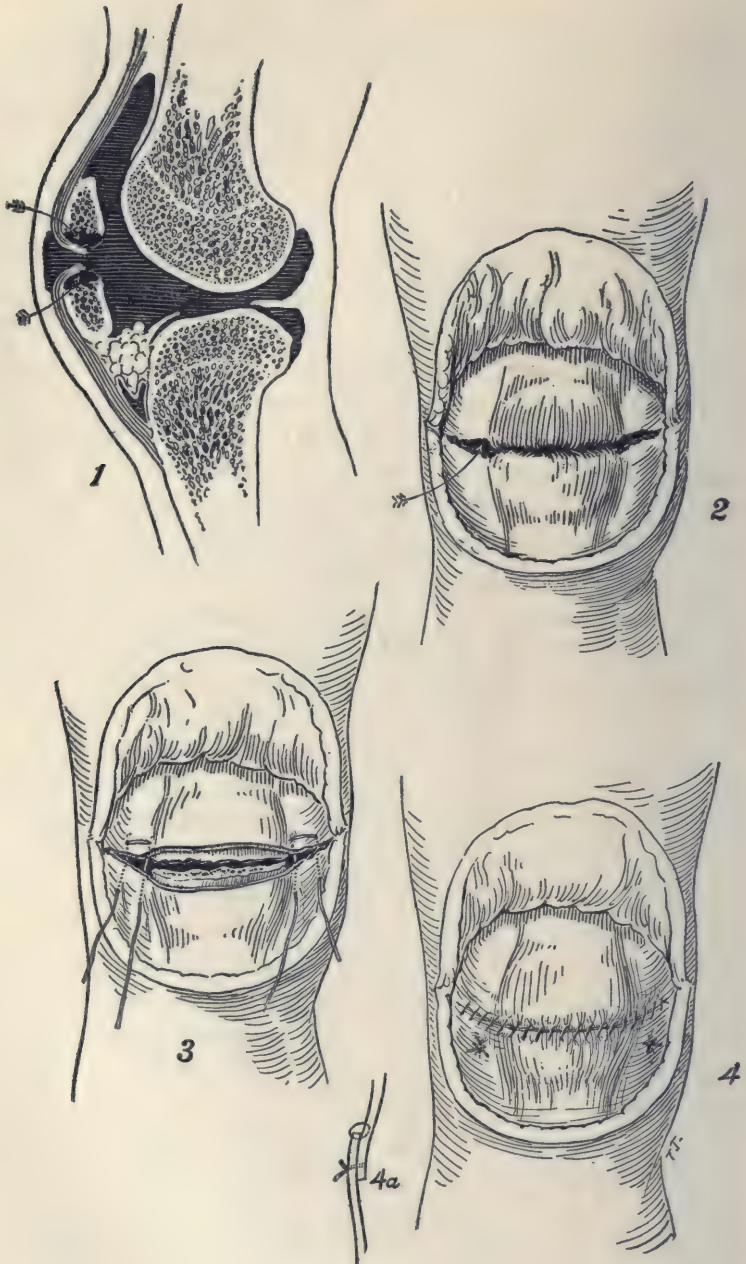


Fig. 129.

dependent of each other, which I have previously told you is an important symptom in the diagnosis of fracture of the patella. We find an extensive tear in the lateral aponeurosis for a distance of 2 inches on each side of the patella. We must expose it until we reach the point where the tear stops. Having removed the blood-clots from between the torn surfaces of the patella and lateral aponeurosis, we proceed as quickly as possible to unite the edges of the lateral aponeurosis with fine kangaroo tendon or chromic catgut (Fig. 129, 3). If the imbrication method similar to that employed in the repair of ventral or inguinal hernia is used, the aponeurosis becomes a very strong structure. This overlapping of the edges of the torn aponeurosis can be rapidly accomplished, and results in such a close approximation of the fractured surfaces of the patella itself that it is seldom necessary to insert more than a few sutures into the aponeuroticoperiosteal covering of the patella. You will observe that I have employed fine kangaroo tendon mattress sutures to bring the lower edge of the torn aponeurosis well beneath the inner surface of the upper half (Fig. 129, 4). The free edge of the upper flap of the aponeurosis will now be approximated to the outer surface of the lower half in accordance with the principles of the overlapping or imbrication method, by a continuous fine chromic catgut suture which stops at the edge of the patella on either side. The torn edges of the periosteal aponeurotic covering of the bone itself is finally united with a fine continuous chromic catgut suture. This completes the operation and we

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Fig. 129.—Fracture of patella: 1, Sagittal view of knee showing effusion of blood into all portions of joint in a case of fracture of patella. Notice how blood-clot separates fragments and how periosteum (arrows) is turned in over fractured surface and prevents accurate union of fragments; 2, arrow points to typical transverse tear of aponeurosis. It is necessary to accurately approximate these edges in an operation for fracture of the patella; 3, mattress imbrication sutures of kangaroo tendon or chromic gut inserted to approximate the torn aponeurosis on either side of fractured patella. Similar sutures can be inserted through periosteal-aponeurotic covering on anterior surface of patella after everting the torn edges, but these additional sutures are seldom required; 4, chromic (fine) catgut continuous suture of overlapped free edges of aponeurosis and of the torn periosteal-aponeurotic covering of the patella.



shall close the wound without drainage by uniting the skin edges with silkworm-gut sutures and immobilize the limb by means of a molded plaster-of-Paris posterior splint.

#### PRESENTATION OF CASE FOUR WEEKS LATER

I wish to show you today the patient with fracture of the patella which we operated upon four weeks ago. The sutures were removed at the end of ten days, the wound having healed by primary union. Both active and passive mobilization were begun on the tenth day. You will observe today that we have secured a practically normal range of mobility of the knee-joint in the interval between the beginning of active mobilization and the present time. I cannot emphasize too strongly the advisability of early mobilization in these cases, especially active mobilization. It is not necessary to employ any particular form of apparatus, but the patient should be encouraged to walk upon the injured limb within two weeks after the injury and to bend the knee himself. In this case much aid has been derived from daily massage of the quadriceps extensor muscle, which rapidly atrophies in these cases, and in passive mobilization of the knee-joint. The case illustrates the rapid advance which we have made in the treatment of these injuries.

## CLINIC OF DR. GATEWOOD

### PRESBYTERIAN HOSPITAL

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#### A STRANGULATED EPIGASTRIC HERNIA

*Summary:* Typical history and physical findings; operation—choice of anesthetic—repair of abdominal wall by the Mayo technic; rarity of epigastric hernias—marked local tenderness a constant symptom.

THIS patient entered the hospital last night on another service and has just been transferred to me. She is a Russian Jewess, sixty-seven years of age. Her general health has been good until the last few years, when she began to get short of breath on exertion. She had had some swelling of her feet, although none is present now. She has had ten children, the youngest of which is twenty-five years old. In 1893, following a prolonged and complicated labor, she noticed a swelling in the region of her umbilicus. This has gradually increased, but is not more than 3 cm. in diameter at the present time. On a number of occasions she has had severe pain in this region lasting sometimes several hours, but never accompanied by vomiting. At such times there would be a hard swelling at or just below the umbilicus. The patient had such an attack nine days ago, and the pain has persisted intermittently ever since. Last evening she began to vomit and her pains became paroxysmal and severe. Her temperature is 98.6° F. and her pulse is 120. She has been habitually constipated, but a good stool was obtained by the use of an injection last night. Examination reveals an obese woman with a tense tympanitic abdomen, moderately tender throughout. She looks sick and seems to be in considerable pain. Just below the umbilicus is a slightly elevated mass, about 3 cm. in diameter, which is so tender that careful examination is out of the question. I

have made the diagnosis of strangulated umbilical hernia and shall proceed at once to operate.

On account of her age and her general condition I should greatly prefer local anesthesia, but owing to the fact that I cannot converse sufficiently with her to gain her co-operation and as there has been no great amount of vomiting, we are employing ether. She has no albumin or casts in the two specimens of urine thus far examined.

I am now making a large elliptical transverse incision (Fig. 130, *a*) encircling the tumor and dissecting back the skin and fat so that the anterior sheath of the rectus and the linea alba are well exposed. An umbilical hernial sac about 6 cm. in diameter is carefully isolated. As I incise the sac I find it is filled with edematous omentum which is adherent to the margins by very dense fibrous adhesions, proving conclusively that the incarcerated omentum has been present within the sac for years. The omentum is now entirely free and I have ligated all bleeding points (Fig. 130, *b*). It does not seem to me that this can explain her acute symptoms, and as I replace this omental stump I shall explore the abdomen. I can feel a mass adherent to the abdominal wall about 5 cm. above my present abdominal opening. This feels like the transverse colon. Dissecting the fat and fascia upward, I find a second hernial sac which did not protrude sufficiently to alter the contour of the abdomen (Fig. 130, *c*). Had the patient not been so tender and had I made a more careful palpatory examination I might have felt this mass. It is evidently a strangulated epigastric hernia and probably the real cause of her symptoms. Isolating the sac, I find that it is shaped like a mushroom and about 3 cm. in its greatest diameter. Opening it by a transverse incision, I find that it contains purplish bowel and considerable dark brown fluid. From the bands and fat tags I know that it is a hernia of the transverse colon. Since but a portion of the circumference of the bowel is included in the hernia we make a diagnosis of Richter's hernia. It is necessary to split the linea alba transversely on either side to relieve the tension and to permit me to examine the strangulated area. Here is a dark brown ring



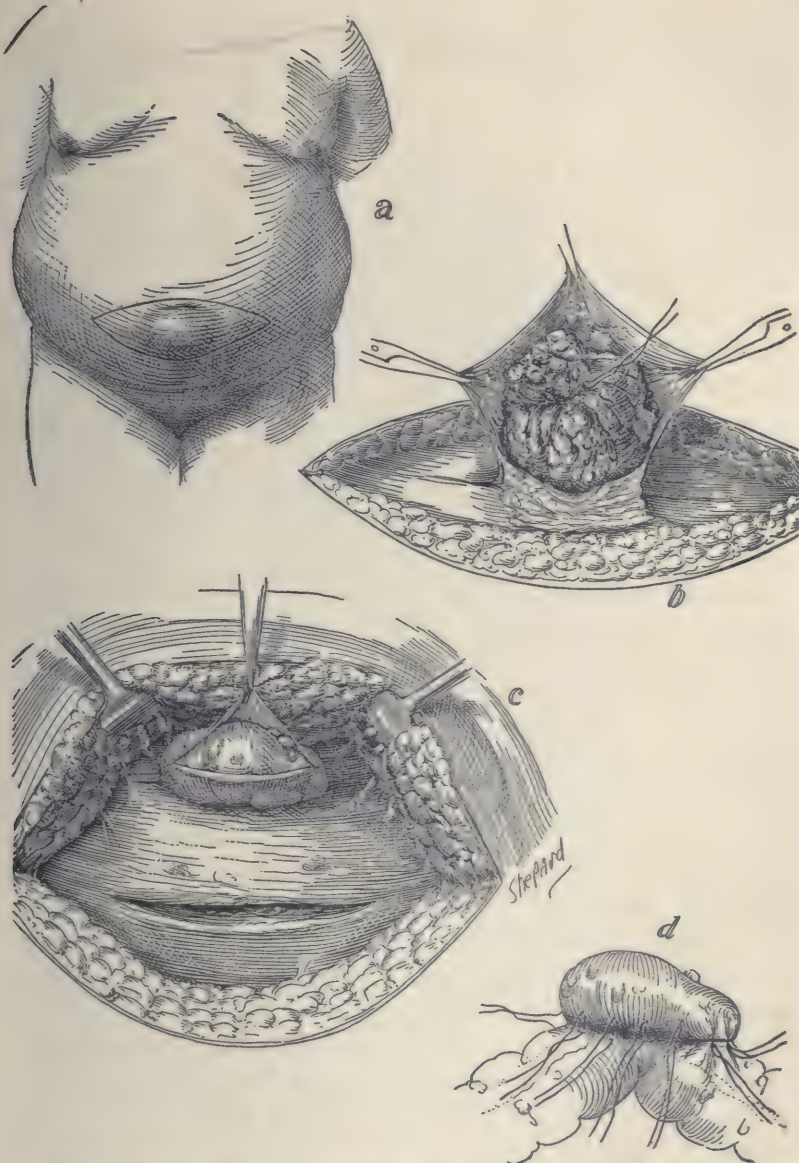


Fig. 130.—*a*, Transverse incision; *b*, umbilical hernial sac freed and opened; *c*, upper margin of wound retracted, exposing strangulated epigastric hernia; *d*, closure of gangrenous ring of colon with Lembert sutures.

about 1 cm. in diameter at the site of the constriction. I shall apply hot towels to this portion of the bowel, changing them frequently for the next few minutes. All of the bowel excepting this narrow ring has entirely recovered its color, and I shall cover in this strip with a few Lembert sutures of fine catgut (Fig. 130, *d*). Were the doubtful area so large that it could not be thus inverted without compromising the lumen of the bowel, I should wait even longer in the hope that the circulation would be restored, for I should hate very much to resect. Having replaced the colon, it is necessary to remove both hernial sacs before closing. These are cut flush with the abdominal aponeurosis.

How shall I repair the two hernial openings? I believe the best method of closing an umbilical hernia is by the transverse imbrication method described by W. J. Mayo. In this instance, however, instead of overlapping from above downward, I am closing the umbilical opening in the reverse manner with three mattress sutures of heavy catgut. Inserting my needle about 2 cm. from the lower margin of the wound, I pass it through the entire thickness of the abdominal aponeurosis and the peritoneum. The needle is now introduced near the margin above the hiatus, carefully taking a good transverse bite of the entire wall. The stitch is completed by passing the needle from within outward in the lower flap about 1.5 cm. lateralward from the point at which it was begun. A forceps is placed on this stitch and it will not be tied until all the others are in place. Three such sutures completely close the opening. I will now close my epigastric opening by overlapping from above downward as in the usual Mayo method of closure (Fig. 131, *e*). This brings the two flaps together and their free borders will be approximated by a continuous catgut suture (Fig. 131, *f*). In order to obliterate the dead space and as a further reinforcement I am putting in several silkworm tension sutures, taking in the aponeurosis. Owing to the possibility of an infection which might dissect a considerable distance in this fatty wall, I shall slip a drain of soft collapsible rubber tubing into either end of the incision. The patient has stood the rather tedious

operation very well and there has been no vomiting during the administration of the anesthetic.

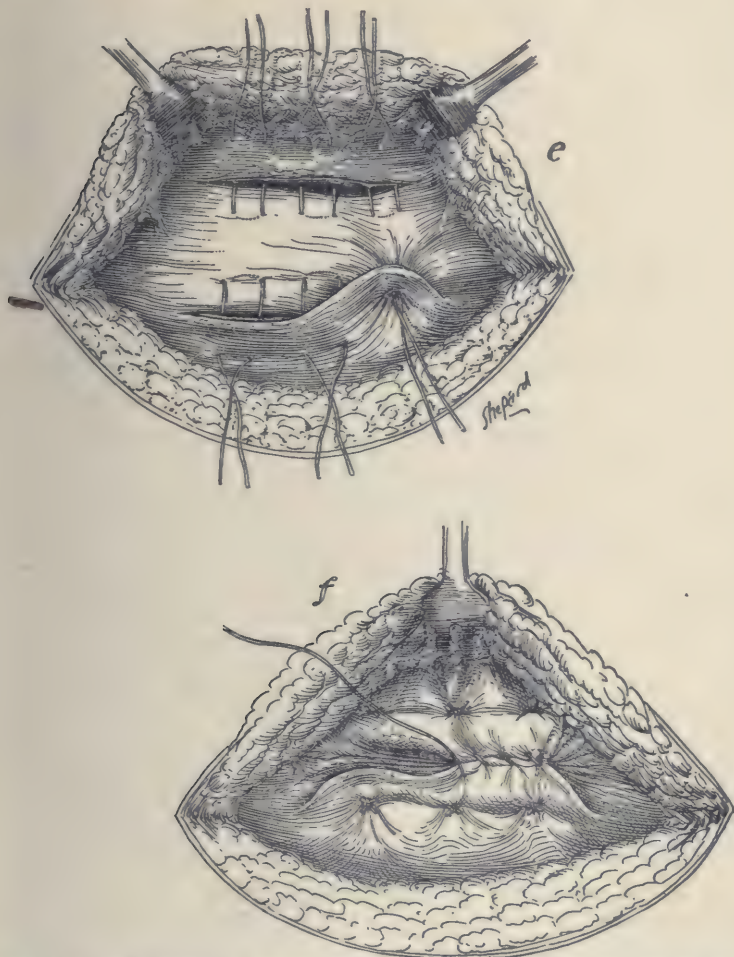


Fig. 131.—*e*, Closure of hernial openings with mattress sutures of heavy catgut; *f*, final suture of overlapped edges.

Epigastric hernias are rare. Of 1000 consecutive hernia operations performed in the Presbyterian Hospital, but 9 were for epigastric hernia. This is the second epigastric hernia which I have seen strangulated. In the first case I made the diag-



nosis before operation and later reported it in the *Journal of the American Medical Association* (1916, p. 85). In that case about 4 inches of small intestine had been strangulated for three days. In looking up the literature at that time I found only about a dozen cases. Since then Mackworth has reported 2 cases which he observed among the natives in India. Moschowitz could only find 4 cases in the literature in which transverse colon was contained in the sac. Epigastric hernias, or hernias of the linea alba above the umbilicus, almost invariably occur within the first 8 cm. above the umbilicus. The majority of them are not true hernias as we are accustomed to think of a hernia. That is, they are merely a protrusion of properitoneal fat through a defect in the linea alba without any peritoneal sac. Most of them develop at the site of a small perforating blood-vessel and rarely are more than 2 cm. in diameter. Some of them are entirely silent, but the majority cause symptoms out of proportion to the pathology. Nausea, vomiting, pain in the epigastrium, and symptoms resembling those of an ulcer have frequently been described. These symptoms have been ascribed to portions of the stomach or bowel becoming pinched in the sac, but the extreme rarity of strangulation and the fact that many of the cases have no peritoneal sac at all makes this theory untenable. It is much more likely that the pain is entirely reflex, either from peritoneal irritation or from traction upon the falciform ligament of the liver. Marked tenderness over the hernia might be mentioned as a constant symptom. This sign alone has been sufficient to make a diagnosis in some cases. One or two cases have been reported in which a fecal fistula developed without general peritonitis. It is possible that such a state of affairs might have developed here by a plastic exudate walling the colon off before the gangrenous area ruptured.

## CLINIC OF DR. EMMET A. PRINTY

### MERCY HOSPITAL

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#### POSTOPERATIVE DIPHThERIC INFECTION OF A HERNIA WOUND

*Summary:* Clinical history of patient; demonstration of diphtheria bacilli in wound and successful treatment by antitoxin.

I WISH to present here a complication sufficiently out of the ordinary to make it interesting.

*History.*—The patient is a married woman, age thirty-eight, no children; one miscarriage (at six weeks) about ten years ago. Menstrual history negative. Family history negative.

*Past History.*—A severe typhoid when twenty-one years of age, and most of her present trouble dates from that time. When a child she had a left inguinal hernia, which was treated with a truss, and for many years has had no protrusion in that region, but has been troubled with aching and occasional pains, especially after long walks, and often at night is awakened by pains of a stretching nature in that region, and finds relief by flexing the left leg.

Present complaint dates back to previous typhoid. A gradually increasing "indigestion," with frequent nausea and occasional vomiting. A great deal of distention at times, and always troubled with "gas." Occasional attacks of colicky pains, not localized. Patient described distress in stomach as being more a difficulty in the food getting out of the stomach than in being digested. Nothing elicited to suggest ulcer. Suffers continually with "backache," especially on arising, usually in lower dorsal and in lumbar region, but sometimes at a higher or lower level. Usually subsides when patient is up and around for a while. Obstinate constipation, taking cathartics regu-

larly, and often necessary to aid them with enemās. Frequent headaches, partly attributable to refractive errors, which have been corrected with glasses.

Physical examination negative as to head, neck, extremities, and spine. Appeared to be of a potentially neurotic type. Abdomen very slightly distended, with stomach, first portion of duodenum, and colon quite tympanitic. Slight tenderness in gall-bladder region and over appendix. Pylorus not definitely palpable, Left inguinal region tender, but no bulging or palpable sac. Subcutaneous (external) ring large. Slight impulse on coughing. Routine blood, urine, and blood-pressure examination negative. Stomach contents negative. Stomach distress relieved greatly by prescription containing sodium bicarbonate, bismuth, and nux vomica.

$\alpha$ -Ray examination of gastro-intestinal tract (plates and fluoroscope) as reported by our roentgenologist, Mr. Arthur E. Willis, consisted of the following in brief: Partial pyloric obstruction, possibly spasmodic, none of meal passing out for forty-five minutes. Stomach lies entirely to left of midline, and pylorus in midline. Later, a collection of bismuth in cecum; hepatic flexure quite distended with gas. Negative as to gall-bladder.  $\alpha$ -Ray of spine made to eliminate any possibility of spondylitis, especially of a posttyphoidal type, as this condition is not so infrequent a complication as might be inferred from the literature, and is often unrecognized. It seemed improbable in this case owing to the long period that the complaint covered, the lack of physical findings, and the absence of disability at any time, but the examination was made in order to overlook nothing, and on account of the severity of the subjective symptoms.

Everything seemed to point to pathology in the region of gall-bladder, pylorus, duodenum, and hepatic flexure, probably adhesions from a mild chronic cholecystitis, and with an associated or primary chronic appendicitis. As satisfactory relief was not obtained by medical measures, operation was decided upon. The hernia and the appendix were to be the definite points of attack, with thorough exploration of the upper



abdomen. This decision was concurred in by Dr. C. F. Sawyer, who saw the case in consultation.

*Operation* (February 4th).—A low right rectus gall-bladder incision. No adhesions encountered. Stomach distended, and first portion of duodenum quite dilated. Pyloric ring small, but normal. Stomach and duodenum had a somewhat congested appearance, but nothing found to suggest old or new ulcerative process, or any localized pathology. Gall-bladder moderately large, but compressible; color slightly pale. No gross evidence of anything necessitating surgical measures. Ducts normal. Duodenum was traced to jejunum, but nothing found to account for dilatation of first portion. No evidence of mechanical constriction at point where duodenum is crossed by base of mesentery and superior mesenteric artery. Colon examination negative. Head of pancreas slightly large.

Incision was extended down through skin and fascia, and a small high appendix incision was made through rectus sheath, muscle, and peritoneum, leaving a connecting bridge of sheath, muscle, and peritoneum between the upper and lower parts of the continuous wound. The appendix was found near the pelvic brim, kinked sharply near its middle, and bound down at that point by a firm adhesion. Tip hard and bulbous. Typical appendicitis obliterans type. Removed in usual way, and stump inverted. Pelvic examination revealed a small, hard, nodular uterus. The left inguinal region was then palpated from within the abdomen. No viscera adherent in that region, but abdominal (internal) ring large, and admitted half or slightly more of first phalanx of index-finger into a peritoneal protusion. Abdominal incision closed, using the author's method of preliminary mattress sutures in peritoneal layer, as described in a previous number of the *Surgical Clinics* (October, 1918).

Left inguinal canal exposed through small incision. Slight adhesions gave evidence of the previous wearing of a truss. No sac could be isolated, but a broad fibrous band, adherent to posterior wall of canal, to edge of internal oblique muscle and to round ligament, proved to be the obliterated remains of the former sac. This was left undisturbed to avoid a needless

trauma. Region closed by Andrews' imbrication method, and with the Andrews stitch. Complete time of operation one hour and twenty-five minutes.

Early postoperative course normal. Temperature  $99^{\circ}$  to  $100^{\circ}$  F., reaching normal on morning of February 6th (eighteen hours after operation). A few hours later it began to rise to  $99.2^{\circ}$  F., then  $99.6^{\circ}$  F., and  $100^{\circ}$  F. at 8.00 P. M. Next day about the same, but fell then to  $99.2^{\circ}$  and  $99.6^{\circ}$  F. following calomel and saline. The following day patient complained to nurse of a hot feeling along the suture line in left inguinal region, and a superficial pain. The following morning examination of that region showed a reddened and indurated appearance of the hernia wound, but no suggestion of discharge or oozing from the suture line. Looked like a cellulitis of streptococcic type. Some sutures were removed and edges separated. Partial healing had occurred. The skin and superficial fascia were seen to be much thickened, the edges of wound irregular, and covered with an adherant dirty gray membrane; no liquefaction. I stated to the intern at that time that this had the appearance of a typical diphtheric infection. The patient on being questioned stated that she had never had diphtheria, but that some years previously her family had been the only one to escape an epidemic of diphtheria in their city. She had very frequently had severe sore throat.

A careful examination of the abdominal wound (to prevent contamination) showed a perfectly normal and healthy area, with no suggestion of an inflammatory process. Hot dressings were applied to hernia region, and temperature fell slightly. White count, 16,400. Smears and culture were ordered, and 2000 units of antitoxin were given. Bacteriologic report from smears and culture showed a Gram-positive diphtheria-like organism, with highly metachromatic granules. As stated in this report, "If clinical findings warrant it I should not hesitate calling this *Bacillus diphtheriæ*." No pus obtained on taking smear; 3000 more units of antitoxin were then given, together with calcium lactate, gr. xv, t. i. d. Temperature normal to  $99.2^{\circ}$  F. since. White count, 11,600. Pulse 78 to 90. Early the pulse

had been 98 to 104; after opening wound and applying heat it fell slightly, and again after injection of antitoxin.

All sutures had been removed owing to reference of pain to their locality, Daily irrigations with Dakin's solution and application of Dichloramin-T. It was thought best not to apply antitoxic serum directly to wound on account of possibility of anaphylaxis, as two doses of serum had been injected. Later a sharply circumscribed area of about the size of a half-dollar, and about 4 cm. distal to inguinal ligament in line with anterior superior spine of ileum, became slightly painful, and felt soft and fluctuating to the touch. Not as a purulent focus would feel, but more as if there had been a non-purulent liquefaction of tissue in that area. This was probed from the wound, and a light brownish liquid escaped. Smears and cultures now showed complete absence of diphtheria organisms, and presence of a Gram-negative cocco-bacillus. No pus organisms.

Throat culture from patient showed variety of organisms, with rarely a Gram-positive clubbed form of bacillus suggesting the involution type of *Bacillus diphtheriæ* (Type A). No virulent type of diphtheria bacillus. Blood count now 5280. Throat smears from attendants negative.

The wound appearance became darker by degrees, from brown to almost black in areas, and dry, especially along skin edges. Cutaneous margins showed a "rat-bitten" appearance, especially at superior and inferior portions of incision. Aponeurotic layer continues intact. The early induration was so marked that I at first thought there might be trouble beneath the aponeurosis, especially as there was no fluctuation; and when the wound was first opened we examined this layer carefully.

The induration has markedly subsided, and there is a slightly brownish discharge with a fecal odor. No gas. Bowel movements continue normal and painless. Appetite better than it has been for years. No gastric distress after meals and no "bloating," as previously.

This case is undoubtedly one of a true diphtheric wound infection. The bacteriologic findings were corroborated by Dr. J. J. Moore of the National Pathological Laboratory. The



appearance of the wound, with membrane and the necrotic process, together with subsidence of symptoms following antitoxin, and subsequent disappearance of diphtheria bacilli from the wound, leave no room for doubt.

These infections usually start as a cutaneous and subcutaneous phlegmon, with considerable induration, and no fluctuation or suppuration until secondarily infected. Trousseau contended that diphtheria attacks the skin only when preceded by some tissue loss, no matter how slight. All of the diphtheric sequelæ may complicate, and must be guarded against by early recognition and exhibition of antitoxic serum.

An early routine bacteriologic examination should be made of all infected wounds, and when they are dressed gloves should be worn to prevent spread of infection, as well as to protect the attendant. In these cases all dressings should be destroyed, and the case isolated.

An interesting feature of this case is that the larger abdominal incision has healed exceptionally well, the stitches removed as usual on the tenth day. Did this infection occur in the operating-room, or subsequently? Or could it be traced to the skin suture material (horsehair)? The discomfort as well as the starting-point of infection seemed to be entirely cutaneous. Investigation will be continued in order to ascertain the source of infection, if possible. An autovaccine will be used to supplement the antitoxin. We anticipate slow healing and an ugly scar.

## CLINIC OF DR. ROBERT H. HERBST

### PRESBYTERIAN HOSPITAL

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#### SEVERE HEMATURIA—EXCISION OF MALIGNANT TUMOR OF BLADDER

*Summary:* Patient giving history of severe hematuria, persistence of hemorrhage preventing preoperative cystoscopic diagnosis; tumor of bladder excised with electrocautery knife, followed by applications of radium to former site of tumor.

THIS patient entered the hospital five days ago giving the following history:

He is fifty-six years of age.

Previous operations: Removal of chancre.

Previous cystoscopies: Day before entrance.

Previous x-rays: None.

Previous illness: Diseases of childhood.

Present complaint: Hematuria, frequency of urination, painful and burning urination.

Onset and course: Present attack of blood in urine began fifteen days ago, and has persisted, patient states, continuously since. Urine is thick, bright red, and contains at times many clots and small fibers. Blood seems to be mixed uniformly with urine rather than appearing at beginning or end of urination. Previous attack two years ago, lasting thirty-six hours, during which time bleeding was excessive.

There was pain, fairly severe in character, present over bladder region. There has been an increased frequency of urination for several years, but more recently it has become marked. Gets up two or three times at night to urinate and frequently during the day. There is an associated burning and pain on urination, which has been present more or less for three years.

Appetite is good; no loss in weight. Bowels move regularly; sleeps well. Is negative to headache, dizziness, failing vision, fever, dyspnea, abdominal distress, etc.

Venereal history: Orchitis, cause unknown. Sore on penis, which was removed surgically. Wassermann test negative.

Physical examination: Patient is a well-nourished adult white male, fifty-six years old. Color is pale, but states he feels fine.

Scalp: Negative.

Eyes: Pupils react to light and accommodation and are equal.

Teeth: Plate above and many crowns and fillings below. Pyorrhea 2 plus.

Tonsils: Negative.

Chest: Expansion is good. Lung borders are normal; no râles. Apex-beat inside the mammary line. Heart tones distinct. Slight hemic murmur. Rhythm regular.

Liver, spleen, and kidney not palpable. Some tenderness over bladder region.

Patellar reflexes present. No edema of feet or ankles.

Rectal examination reveals left seminal vesicle enlarged and tender.

I am going to open this man's bladder today because he is bleeding so rapidly that we have not been able to determine cystoscopically the nature of the intravesical pathology, and he has reached a point where it will be unsafe to delay further operative interference.

Bleeding from the urinary tract will usually quiet down when the patient is placed at absolute rest in bed with a liberal administration of morphin, and possibly the addition of horse-serum. Whenever given a case of hematuria which can be carefully watched as to pulse-rate and blood findings, it is well to follow it until one can determine the location and cause of the hemorrhage. Today this man's pulse is running about 130. His hemoglobin is between 35 and 40 per cent. His red count is 2,000,000. In other words, he has reached the limit. You will note from his history that he was bleeding for fifteen days



before he entered the hospital, and during his five days here we have not succeeded in controlling the hemorrhage sufficiently to make an efficient cystoscopic diagnosis.

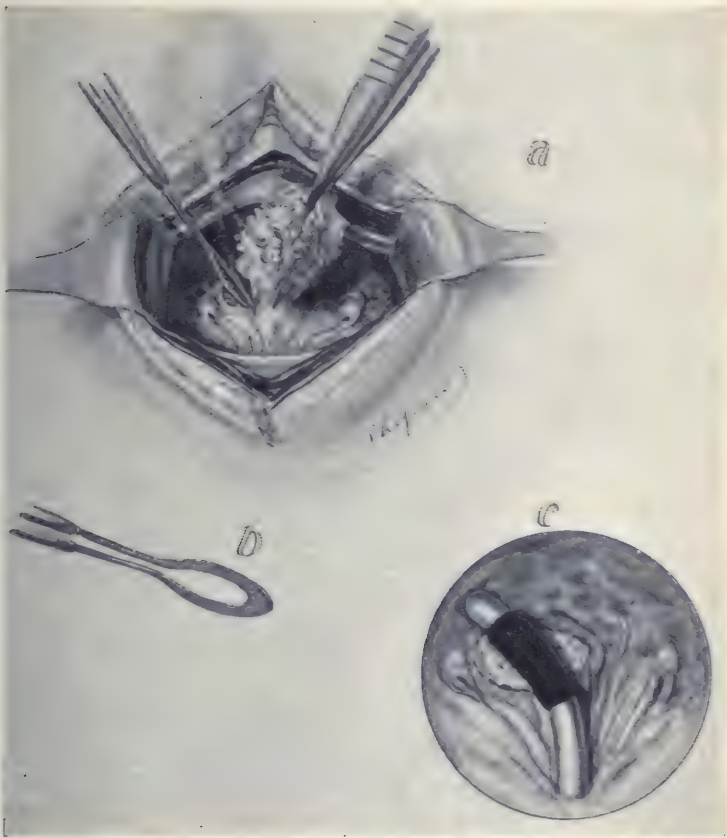


Fig. 132.—Excision of papilloma of bladder with electrocautery knife: *a*, Grasping pedicle of tumor with forceps and excising with electrocautery knife; *b*, electrocautery knife; *c*, application of radium to former site of tumor.

I am now going to make the usual incision through the abdominal wall, making the incision into the bladder sufficiently large to obtain good inspection of the interior. You will note that the bladder is filled with blood-clots, which I will now turn

out. I can see a tumor about the size of an English walnut, which is attached by a broad base to the posterior wall of the bladder just internal to the right ureteral orifice. I will carefully grasp the pedicle (Fig. 132, *a*) and with this electrocautery knife (Fig. 132, *b*) I will excise the tumor close to its insertion to the bladder wall. I will now thoroughly cauterize the base. There are no other tumors to be found, and as the bleeding has entirely ceased I will insert this drainage-tube and close in the usual way.

I do not wish to take the time today to discuss the pathology of bladder tumors, but merely wish to state that I take about the following course in handling these cases: All tumors that appear to be clinically benign are removed by fulguration. Tumors which are suspiciously malignant, or prove to be so, and located in accessible parts of the bladder I excise with the bladder wall. Malignant tumors located in inaccessible parts of the bladder are either removed by fulguration or the electrocautery knife, and such removal is followed by the application of radium to the area from which the tumor is removed. In using radium in the treatment of these tumors I believe it is essential that it be applied directly to the tumor area (Fig. 132, *c*). This is not easily accomplished by introducing it through a suprapubic wound because of the difficulty of keeping the radium in place, but can be well carried out in most instances by introducing it through the urethra, the radium being placed in the beak of a sound. In this way it can be fixed.

**Later Course.**—This patient is one from which we removed a bladder tumor some weeks ago. Sections showed it to be a papillary carcinoma. We will now introduce a cystoscope through this small suprapubic wound. I can see just to the left of the right ureteral orifice a small area about the size of a 10-cent piece. This appears as an area denuded of mucous membrane. I will insert this sound through the urethra into the bladder, and, by turning the handle of it to the right, I bring the part containing the radium in contact with the area from which the tumor was removed. We will reintroduce the cystoscope later to determine whether the sound is still in the

correct position. There are 50 mg. of radium in this sound and we will give him about a twelve-hour exposure.

**After-history.**—Three months after operation the bladder wound is closed. Cystoscopic examination reveals just a slight reddening at the former site of the tumor. The area appears to be covered with healthy mucosa.

**Pathologist's Report.**—Microscopically the tissue is composed of irregularly arranged villous processes. The width of a villous process varies from 10 to 20 cells. These cells are irregularly arranged, are of various widths, and contain mitotic figures. Microscopic diagnosis, papillary carcinoma.





## PROSTATECTOMY FOR HYPERTROPHY OF THE PROSTATE GLAND

*Summary:* Importance of pre-operative study in selection of the candidate for prostatectomy; use of blood chemistry in making such a selection; value of the two-stage procedure in some cases.

THE next case I wish to present this morning is that of a man fifty-nine years old, whose chief complaint is frequent and imperative urination.

His history is negative as to previous illness, operations, cystoscopies, and *x*-rays.

Patient states that for the past three or four years he has gotten up five to seven times every night to urinate, and during the day urinations occur more often. There has been a steady progression in the frequency. The amount of urine passed at one time is small, but there is often great difficulty encountered in starting the stream. However, once the urine has started, the flow goes on without interruption. He thinks the size of the stream is smaller perhaps than formerly. There is no pain before, during, or immediately after urination, and also there is no associated burning or discomfort. The urine is free from macroscopic blood or pus so far as he knows.

He states that he is quite constipated, by which he means the bowels move irregularly if not influenced by a cathartic.

Negative to headache, dizziness, tinnitus, palpitation of the heart, sore throat, abdominal distress, etc. Appetite is good. Slight if any loss in weight; sleeps well; alcoholics none.

Venereal history: Gonorrheal infection at fifteen years. Never had a lesion on penis.

Marital history: Married thirty-five years. Two children dead, both from peritonitis following appendicitis.

Physical examination is negative. Pupils are equal and react to light and accommodation. Liver is palpable just above costal margin and is not tender. Spleen, kidneys, and colon

are not palpable. No masses; no glandular enlargements. Patellar reflexes lively. External genitalia negative.

Rectal examination shows a moderately enlarged prostate, left side of which is larger than right. The surface of the tumor is smooth.

#### QUANTITATIVE ANALYSIS OF URINE

	Vol. of urine, c. c.	Specific gravity.	Total solids, grams.	Reaction.	Sugar, grams.	Albumin.
1st day.....	1500	1030	96.6	alkaline	0	3 mm.
2d day.....	1200	1030	99.1	"	0	3 mm.
3d day.....	1000	1030	99.9	"	0	3 mm.

First kidney function test: Phenolsulphonephthalein intravenously. Time of appearance, eleven minutes. First half-hour, 20 per cent.; second half-hour, 15 per cent.

Second kidney function test: Time of appearance, five minutes. First half-hour, 45 per cent.; second half-hour, 15 per cent.

Bladder urine: 40 cells.

Cultures of urine from bladder: Growth, staphylococcus.

His blood-pressure varies between 190 and 210. Residual urine averages about 11 ounces.

Examination of blood showed blood urea, 295 mg. per liter of whole blood.

Considering the high blood-pressure, this patient cannot be called a first-class risk. In selecting a candidate for prostatectomy we must give special consideration to the kidney function, because we know that many prostatics die because of impaired kidney function. Lately we have been supplementing our dye-tests for kidney function with an investigation of the chemistry of the blood. By doing this I feel that we have a fair index of the work being done by the kidneys. You will note that this man has a fair output of dye, and although his urea-nitrogen is above normal, it can still be considered within safe limits. With these findings in mind, I have decided to make a two-stage prostatectomy.

The bladder has been irrigated, and about 12 ounces of sterile water have been left in it. I will make an incision in



the median line about 3 inches in length, going through the skin and superficial fascia. Separating the recti, we come down to the prevesical fat. With the finger covered with a gauze sponge

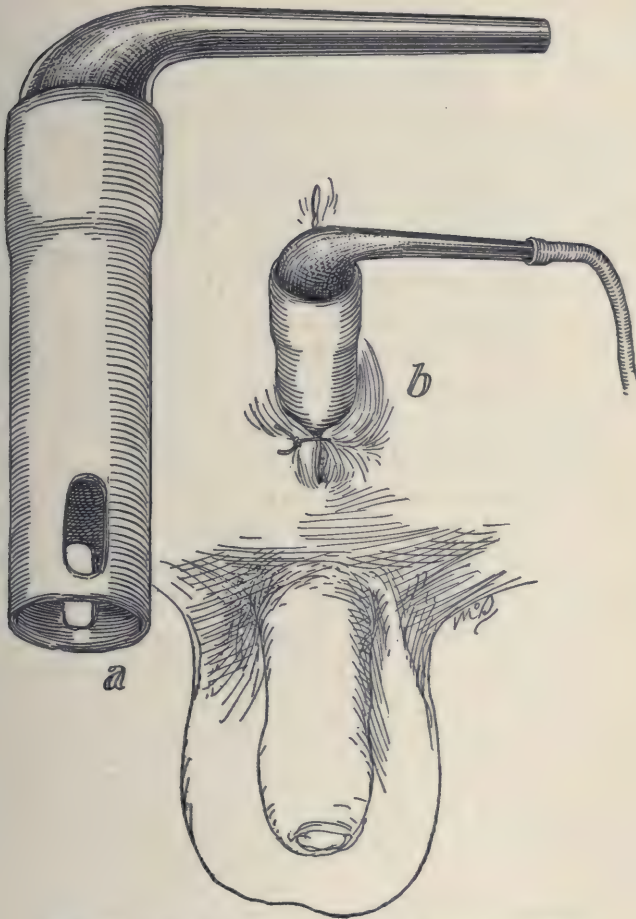


Fig. 133.—*a*, Freyer drainage-tube; *b*, tube in position.

I will push the fat and peritoneum upward, which exposes the bladder wall. I plunge the knife into the bladder, making an incision about 1 inch in length and as high up as possible. Inserting my finger into the bladder, I can palpate a mass sur-

rounding the internal urethral orifice, which is smooth and is evidently a benign adenoma of the prostate gland. No stones are to be found in the bladder. I will now introduce into the bladder this tube (Fig. 133, *a*), which is called the Freyer drainage-tube. This is so placed that the end does not touch the posterior wall of the bladder. The stitch I am about to insert will prevent any leakage around the outside of the tube, because it fixes the anterior wall of the bladder to the abdominal wall, which is the all-important factor in preventing leakage around a bladder drainage-tube. This stitch, which is silkworm-gut, is inserted through all layers of the abdominal wall, including the upper angle of the incision into the bladder wall. You will note that it serves two purposes. It closes the incision in the bladder wall snugly about the tube and fixes the anterior wall of the bladder to the abdominal wall. I will close the incision in the usual way and attach to this glass tube a rubber tube which will carry the drainage from the bladder into a bottle which is attached at the side of the bed. In using this method we are able to keep our bladder cases just as dry as any closed laparotomy (Fig. 133, *b*). In the course of the next week or two this man will have a reaction caused by the relief from the back-pressure of urine to his kidneys, and when he has fully recovered from this we will enucleate the prostate gland.

**Two Weeks Later.**—This is the patient whose bladder we drained two weeks ago. The relief from the retention of urine was followed by quite a severe reaction which occurred on the fifth day, and from which he has now completely recovered. You will note that the incision is healed with the exception of this small opening, which has been kept open by the drainage-tube.

I will enlarge this opening by making a small transverse incision on either side down to the fascia. My assistant is now pushing up the prostate by inserting his finger into the rectum. I will insert my middle and index-finger into the bladder, and, breaking through the mucous membrane just within the prostatic urethra, I will pare out the hypertrophied part of this gland. You will note there is practically no bleeding, so we will

reinsert the drainage-tube, which will remain in place about forty-eight hours.

**After-history.**—This patient developed a temperature about the tenth day after the enucleation, which, however, passed off in the course of a few days, and was probably caused by a colon pyelitis. The bladder wound is now closed and his urinary function is gradually approaching normal.

**Pathologist's Report.**—Microscopic section showed a mass of greatly enlarged and dilated tubulo-alveolar glands, with a great deal of intratubular smooth muscle tissue. No signs of malignancy were found. Diagnosis: Benign adenoma of the prostate.





## EXTENSIVE STRICTURE OF THE URETHRA

*Summary:* Cutting operation required in but small percentage of strictures; difficulties encountered in external urethrotomy without a guide; urethral implantation rarely successful; extensive operation followed by good urinary function.

THIS patient's history is as follows:

He is fifty-seven years old. He comes in because of difficulty in urination, accompanied by frequency and burning.

Onset and course: Beginning about one year ago and progressing since, patient states that he has had difficulty with urination, until at present it is practically impossible for him to pass his urine. The stream, which is very small, is started with great difficulty and only after a great deal of straining. After straining, stream suddenly stops and more straining is required to start it. Moreover, he feels that he never fully empties the bladder, and therefore experiences frequency every two hours at night and oftener during the day. Burning, but no severe pain, is present. Chills and fever have occurred since onset; at first once a month, and lately every two weeks, not accompanied by headache.

Venereal: Gonorrhea thirty years ago.

Marital: Married thirty-seven years (twice). Four children living and well by first wife; one miscarriage. One child by second wife, living and well.

Family history: Father is living and well. Mother died at seventy-one, senility. Two brothers and two sisters living and well.

Physical examination: Patient is an adult white male, fifty-seven years old, who is well nourished.

Eyes: Pupils are equal and react to light and accommodation.

Teeth: Many crowns apparently in poor condition.

Nose: Sinus infection one year ago.

Tonsils: Negative.

a

Grooved staff  
blocked in anterior  
portion of bulbous  
urethra

b

Wheelhouse sound  
with hook at tip

Filiform bougie

Shaping

c

Incision extended



Chest: Expansion is good and equal on both sides; no dullness; no râles. Apex-beat inside mammary line. Rhythm regular; pulse-rate normal; no murmurs.

Liver and spleen not palpable. No tenderness; no masses. Bladder is slightly distended.

Urine: Quantity, 1400 c.c.; specific gravity, 1020; appearance, cloudy; reaction, alkaline; albumin, nucleo, trace; serum, 2.5; no sugar or casts; many leukocytes; total solids, 34.9 grams.

Blood: Red cells, 4,500,000; leukocytes, 6000; hemoglobin, 90 per cent.

Blood-pressure: Systolic 110 and diastolic 60.

Patellar reflexes are present; no edema.

External genitalia: Right epididymis is nodular, firm, and tender. Patient states this is due to a trauma several years ago.

Rectal examination: Prostate is enlarged, smooth, and regular. Seminal vesicles palpable.

The introduction of a small size Acorn sound (French No. 12) meets an obstruction in the anterior extremity of the bulbous urethra. Numerous attempts with a Banks bougie and filiform bougies fail to pass the obstruction. Each one of these instrumentations has been followed by chill, temperature, and more or less toxemia. The last attempt was made two days ago and was followed by some swelling in the perineum and in the right side of the scrotum, evidently due to the slow leakage of urine into the tissues. For this reason I have decided to operate on this patient today.

There are only two types of stricture cases which require cutting operations, namely, the impassable stricture, of which this is a type, and those which are dense and fibrous and resist dilatation. I will make an external urethrotomy without a guide, which changes the operation from one of the most simple in surgery to a rather difficult procedure.

I will first introduce this grooved staff into the urethra down to the distal extremity of the stricture, which is in the anterior

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Fig. 134.—*a*, Median perineal incision exposing urethra containing grooved staff; *b*, longitudinal incision on grooved staff, opening urethra; *c*, unsuccessful attempt to pass filiform bougie through strictured area.

part of the bulbous urethra. My incision is now made in the median line in the perineum (Fig. 134, *a*), introducing the point of the knife into the groove of the staff and opening the urethra 1 cm. anterior to its extremity (Fig. 134, *b*). By now turning the staff around I will hook up with the end of it the anterior angle of the incision into the urethra, and by means of these two small hook-shaped retractors inserted into either side of the urethral incision I am able to expose the interior of the urethra. I will now try to pass this filiform bougie through the stricture (Fig. 134, *c*). You will note that I cannot find any lumen here, so I will proceed to make a complete perineal section and expose the entire urethra back to the tip of the prostate.

Enlarging this skin incision to either side brings the central tendon of the perineum into view. I will cut this close to the urethra, and, by means of a careful dissection, will cut the rectourethralis muscle, which you will note allows the rectum to drop back and exposes the tip of the prostate. I will now see if I can find any bulging of the urethra behind the proximal extremity of the stricture. If so, I will open the urethra here and attempt to pass a filiform retrograde through the stricture. I regret to say that I cannot see any bulging, but can feel this fibrous band, which is the strictured urethra extending into the tip of the prostate. Not being able to find the lumen of the urethra here, I will rapidly make a suprapubic cystotomy. By the aid of my two fingers in the bladder I now introduce this sound in a retrograde manner into the prostatic urethra until it reaches the proximal end of the stricture. Now, retracting well the opening in the perineum, I see the tip of the sound at the anterior extremity of the prostatic urethra, so I will open the urethra at this point. You will note that we now have an opening in the urethra at the distal end of the stricture, which is in the bulbous urethra, and another at its proximal extremity, which is at the tip of the prostate. I will now make a longitudinal incision between these two points (Fig. 135, *d*), which is practically the obliterated urethra. I will introduce a catheter at the meatus of the urethra, passing it along into the prostatic urethra and well into the bladder, and you will note that this

catheter (Fig. 135, *e*) fits into the groove made by the incised fibrous urethra. We will now close the wound in the perineum, putting in a small cigarette drain. I will close the suprapubic opening in the usual way, leaving a small tube in the bladder for drainage. I will allow this catheter to remain in place for about a week or ten days, giving sufficient time for the tissues

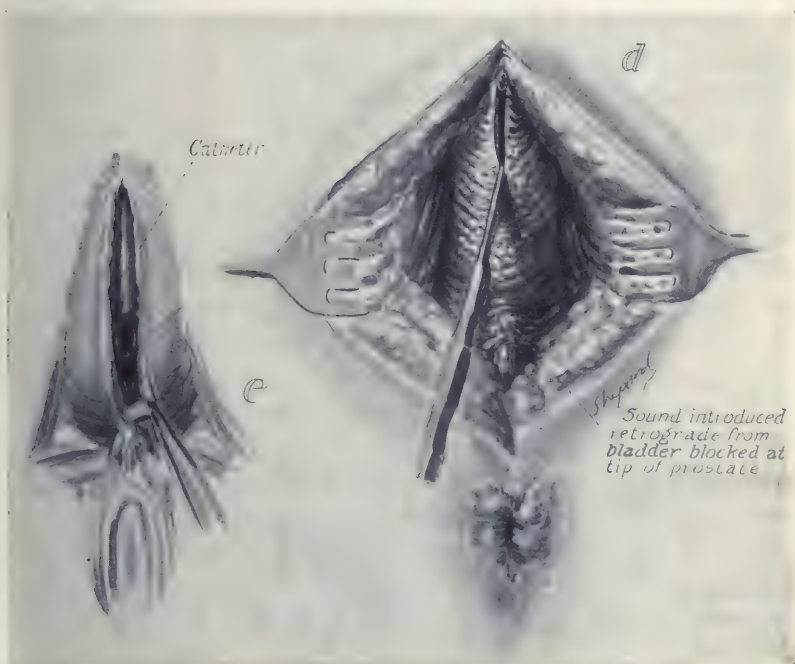


Fig. 135.—*d*, Incision being made along strictured part of urethra, uniting opened extremities of strictured urethra; *e*, introduction of catheter into bladder. Exposed portion showing extent of incised stricture.

to close in well about it and practically form a new urethra. I believe the mucous membrane eventually edges its way into this strictured area.

I have completely abandoned the use of implants in these cases of extensive stricture, because, in my own limited experience, I have never had any success with them. Just how the repair in the urethra goes on after an extensive operation of this



kind I am not in a position to state, but the functional result is usually all that one can expect. Excision and anastomosis in a stricture as extensive as this could not be carried out.

A week after this catheter is removed I will introduce a sound at weekly intervals for a month. This should follow all cutting operations for stricture, it being the only means we have of preventing recurrence.

**After-history.**—You will note that both the suprapubic and perineal wounds are closed and I can pass this large sound without any difficulty into the bladder. The urinary function now is about normal.

## BILATERAL COLON PYELITIS WITH CYSTITIS

*Summary:* Difficulty of determining mode of invasion of kidney pelves; treatment by pelvic lavage; demonstration of method.

THE next case I wish to present belongs to a class which is rather commonly found in urologic practice.

The patient is a married woman aged thirty. She states that she had very good health until one year ago in September, when she had a threatened abortion at five months. At that time pregnancy was terminated in the hospital and a very good recovery was made. In September of this year she contracted a cold while menstruating. Two or three days later she noticed blood in the urine in two or three specimens. The blood apparently did not come from the vagina. There was also frequency and burning on urination. No further symptoms were experienced for one week. At that time, at 9 A. M., just after getting up, she was seized with severe pain in the region of the navel, which was severe enough to double her up. This continued for two hours, the pain radiating to the back on both sides, which left tenderness in the abdomen and in the sides in the region of the flanks. Following this she had chills and fever for two weeks. After this the temperature disappeared and she got up. In three days the temperature returned and has been present three to four days out of each week since. There has been very little pain except in the right side, which becomes tender when she has a temperature. At about ten years of age she had severe pain in the right side lasting three to four hours. Another attack ten years ago lasted five to six hours. Since then she has had similar attacks about twice a year. Had one on street car, accompanied by cold sweats, vomiting, nausea, and severe pain. All these attacks were similar to this last attack. She thinks she has had no temperature with them.

Physical examination: Patient is an adult white woman, undernourished and pale.

Pupils are equal and react to light and accommodation. Teeth are in good condition and tonsils are negative.

Chest: Heart borders are normal. Rhythm is regular and no increase in rate; no murmurs. Lung borders normal. Chest expansion good; no dulness; no râles.

Liver and spleen not palpable. Right rectus muscle seems distinctly more resistant to pressure than the left. Right kidney is palpable and somewhat tender; no further masses felt.

Patellar reflexes present. No edema of feet or ankles.

Physical examination: Uterus is retroverted and cervix long; body of uterus not palpable.

Urinalysis: Total quantity, 4000 c.c.; appearance, clear; color, yellow; specific gravity, 1008; reaction, alkaline; no albumin; leukocytes present.

$\alpha$ -Ray of urinary tract negative.

Cystoscopic examination: Bladder wall is slightly injected and red; mild cystitis. Ureteral orifices appear normal. Small white pus plug(?) seen in front of left ureteral orifice. Right kidney secretes about twice as fast as left.

Cultures: Bladder, pus cells, 3200; *Bacillus coli*. Right kidney, pus cells, 200; *Bacillus coli*; left kidney, pus cells, 600; *Bacillus coli*.

From this history and these findings a diagnosis of bilateral infection of both kidney pelves and bladder by the colon bacillus is self-evident. This infection of the urinary tract in women is extremely common. However, in most cases it is not always easy to determine the origin of the infection. Authorities differ in their beliefs as to the routes by which this organism gains access to the urinary tract. Along these lines the following theories have been advanced:

1. That the colon bacillus travels by way of the lymphatics from the colon to the kidney.
2. That the infection travels by way of the blood-stream from a distant focus.
3. That it ascends either by way of the urinary tract or by way of the lymphatics along the ureter.

In this case the origin is apparently quite clear, because



this woman has suffered from a colitis for a long time. These cases are often protracted and difficult to clear up completely and permanently. I am going to practice a method of treatment here which we use in many cases of this type.

I will now introduce this double catheterizing cystoscope and allow the urine to drain out, and then thoroughly wash the bladder with warm sterile water. You will note that the return water is clear, so we will fill the bladder. Looking into the cystoscope I note that the bladder wall is hyperemic throughout; otherwise nothing abnormal is to be seen. I will pass one of these catheters up each ureter into the kidney pelvis and allow them to drain for a short time. By means of this syringe and needle I will inject into each kidney pelvis some warm boric acid solution and allow this to drain out; in other words, washing out the kidney pelves. We will then inject a 2 per cent. solution of silver nitrate, filling the kidney pelves. We will draw out the catheters and remove the cystoscope from the bladder. This method of treatment can be repeated every four or five days. The patient will also be instructed to drink large quantities of water and will be given  $\frac{1}{2}$  dram of urotropin and acid sodium phosphate four times a day. We do not consider these patients cured until we obtain urine from each kidney which is shown to be sterile by cultures. Not infrequently we find these patients during an attack of colon pyelitis run a very high temperature accompanied by a severe degree of toxemia. These attacks are often cut short by the introduction of ureteral catheters which are allowed to remain for a number of hours for the purpose of drainage.



## VASOTOMY IN A CASE OF PERSISTENT SEMINAL VESICULITIS

*Summary:* A large percentage of gonorrheal infections of the male urethra ultimately involve the seminal vesicles; infection in these vesicles is frequently the cause of the persistence of the infection; importance of directing attention to these organs in cases which do not respond to the older methods of treatment; the determination of cure.

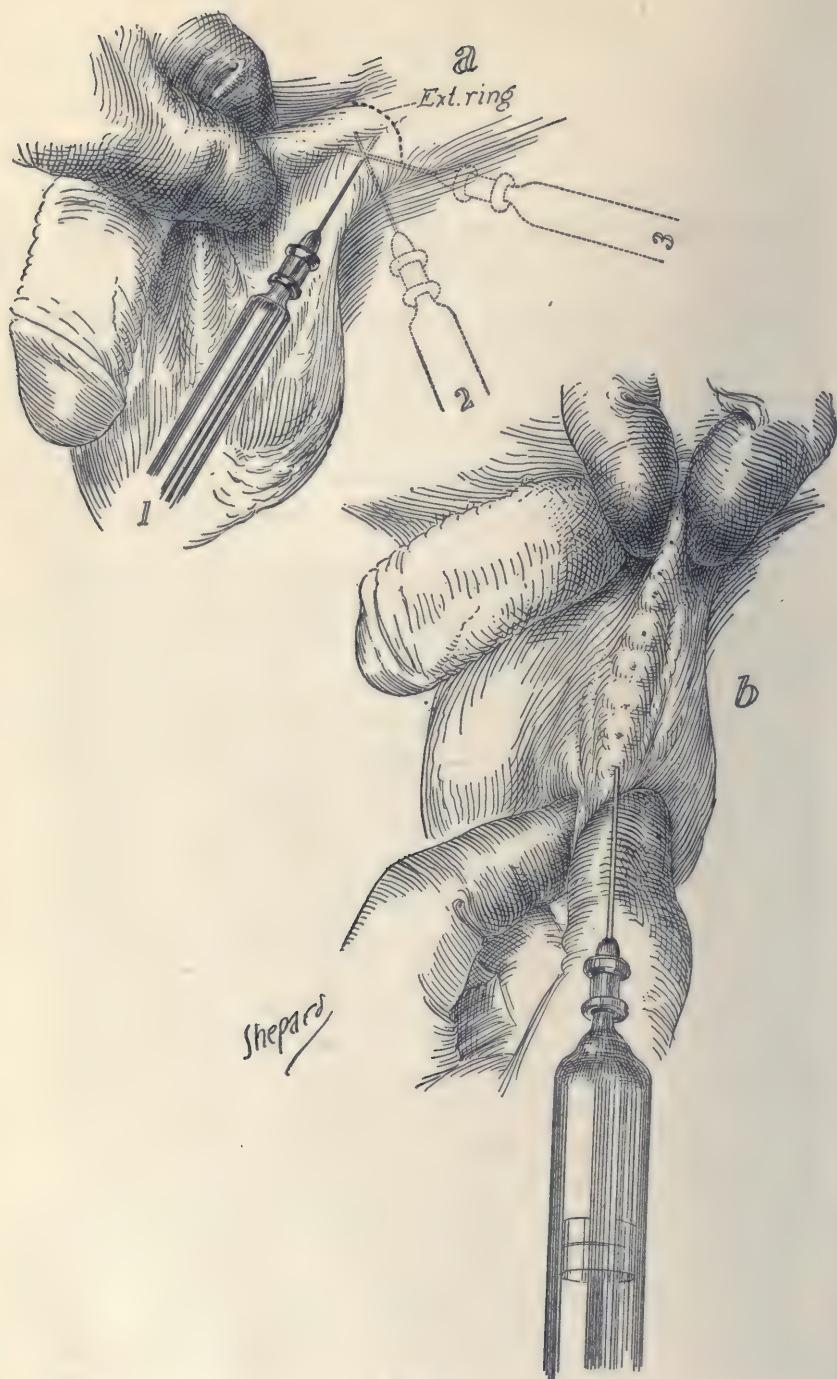
THE history of this patient is as follows:

He is twenty-seven years old. Has had gonorrheal infection twice.

Present complaint: Swelling and tenderness of right testicle.

Onset and course: Six years ago, patient states, he had a Neisserian infection lasting six weeks, during which time he had treatment. Infection cleared up without any involvement of the epididymes. There was no morning drop following. Three years ago he had a second infection, also lasting six to seven weeks, associated with no testicular swelling. At the end of that time the discharge did not entirely disappear, leaving a morning drop. This morning drop has persisted practically to date. At times it is present for a week or more and then disappears for five or six weeks. Prostatic massage and sounding has been done at intervals since. About one month after disappearance of discharge (three years ago) patient states that right epididymis became swollen following massage of prostate and passage of a sound, which lasted for one week, the right testicle being swollen to a size approximating a clenched fist and accompanied by a temperature of 102° F. Discharge absent during acute affair, but appeared immediately thereafter. Size of stream is as large as ever; no difficulty in starting. Patient states that following excesses, no matter how mild, discharge is increased. Two weeks ago patient noticed swelling in the right spermatic cord, and on the following day a swelling in right epididymis. He can attribute it to no excesses of any kind.





Swelling has persisted to date. Epididymis is about one-half larger than left.

Family: Father died at fifty-two of paralysis. Mother and three sisters living and well.

Physical examination: Pupils equal and react to light and accommodation.

Teeth: Several fillings, apparently in good condition.

Tonsils: Slight hypertrophy.

Chest: Expansion good; lung borders normal; no dulness; no râles. Apex-beat is inside mammary line; rhythm regular; no murmurs.

Abdomen: Negative.

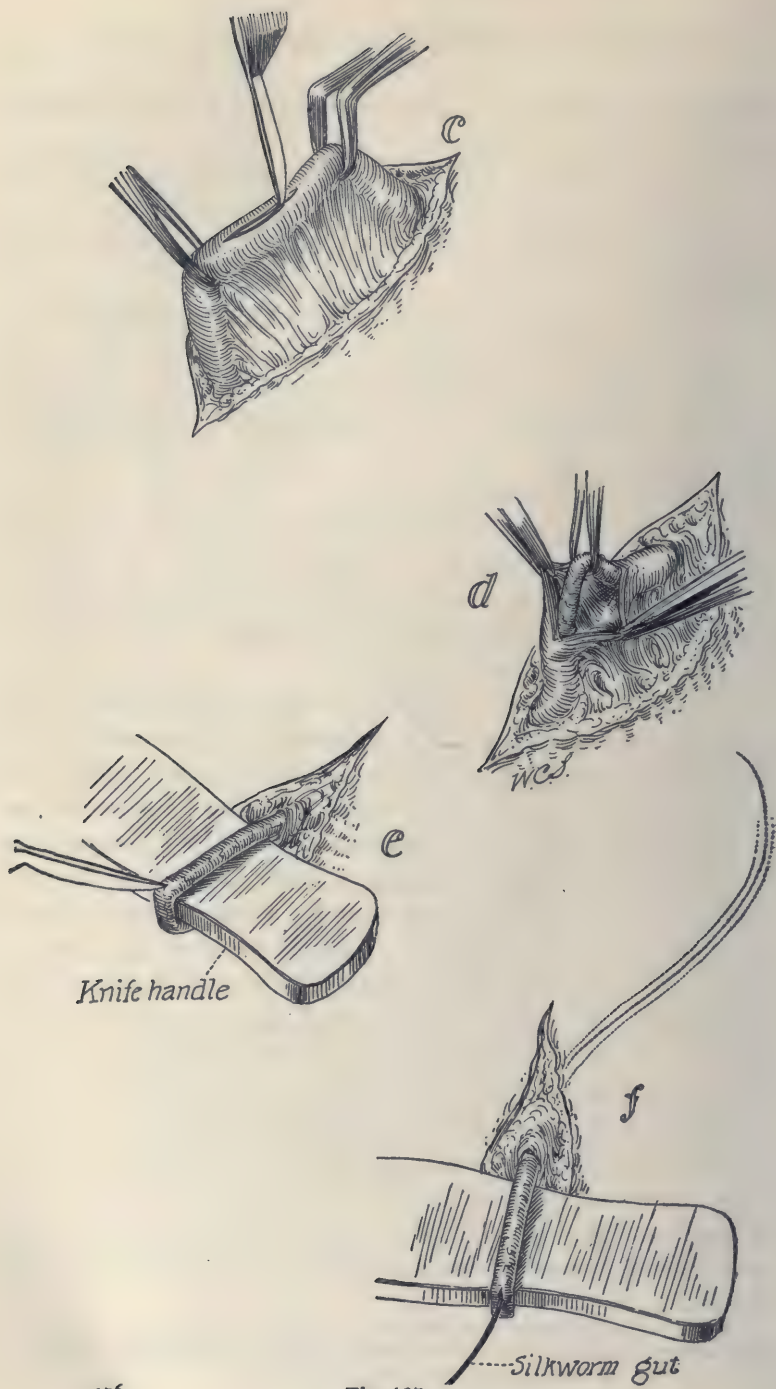
Genitalia: Right testicle is swollen to twice the size of the left. Epididymis seems to constitute majority of swelling. Palpation in the rectum reveals a prostate but slightly enlarged. However, both seminal vesicles are extremely large and hard, the right being the larger.

On admission to the hospital a week ago the patient was placed in bed and the scrotum elevated by a sling and covered with a compress moistened with a saturated solution of magnesium sulphate. The swelling in the epididymis has rapidly reduced in size and the pain and tenderness have entirely disappeared.

It is evident from the history and examination of this case that this patient has had an infection going on in the lower extremity of his genital tract (seminal vesicles) for the last three years. Also this, like so many other cases of the same kind, is secondary to a gonorrheal infection of the urethra and has been the cause of the persistent urethral discharge. It is also clear that excesses and manipulations, such as stripping and sounding, have a tendency to produce an extension of the infection from the seminal vesicles along the vas and epididymis. I am, therefore, satisfied that the only way to clean up this infection permanently is to direct our attention to the seminal vesicles. This we will do by making a bilateral vasotomy this morning.

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Fig. 136.—Vasotomy: *a*, Injection about cord at external ring; *b*, infiltration of anterolateral wall of scrotum.





I now pick up the cord and inject about it, where it comes out of the external ring (Fig. 136, *a*), a few cubic centimeters of  $\frac{1}{2}$  per cent. solution of apothesine. I will now infiltrate the skin of the anterolateral wall of the scrotum (Fig. 136, *b*), beginning at the upper pole of the epididymis and extending up to the external ring. I make an incision along this line about  $1\frac{1}{2}$  inches in length through the dartos, exposing the cord. Isolating the vas from the rest of the cord, I pick it up with these two forceps. I now dissect away the sheaths (Fig. 137, *c*), exposing the vas proper (Fig. 137, *d*), and make a small longitudinal incision into its lumen (Fig. 137, *e*). This incision is not more than  $\frac{1}{8}$  cm. in length. I will introduce this strand of silkworm-gut into the lumen of the vas (Fig. 137, *f*), passing it up to the vesicle, in this way testing its patency. Withdrawing the silkworm-gut, I will now introduce the point of this syringe (Fig. 138, *h*) into the vas and inject into it a 3 per cent. solution of collargol, filling the vesicle (Fig. 138, *g*). You will note that I readily pour 25 c.c. of this solution into the vesicle, which evidently more than fills it, the overflow passing into the posterior urethra and bladder. In other words, I practically irrigate the genital tract. It is well to keep the vas out of the scrotum for a few minutes, otherwise a small quantity of the collargol may return down the vas, producing a painful swelling, which can be avoided by sponging off the collargol as it appears. The vas is now dropped back and the sheath closed by one catgut suture and the skin incision sutured in the usual way (Fig. 138, *i*). I will repeat this performance on the other side. Some of this solution remains in the vesicle from a week or two to a month or more. Recently I had a patient report to me that he had a black seminal emission fifty-nine days after a single injection with collargol. A dressing is now placed on either side of the scrotum, which is supported by a Bevan triangular sling.

**After-history.**—This patient's wounds are now healed and

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Fig. 137.—*c*, Dissection of sheaths from vas; *d*, exposed vas picked up with forceps; *e*, minute incision into vas; *f*, passage of silkworm-gut along lumen of vas, testing its patency.

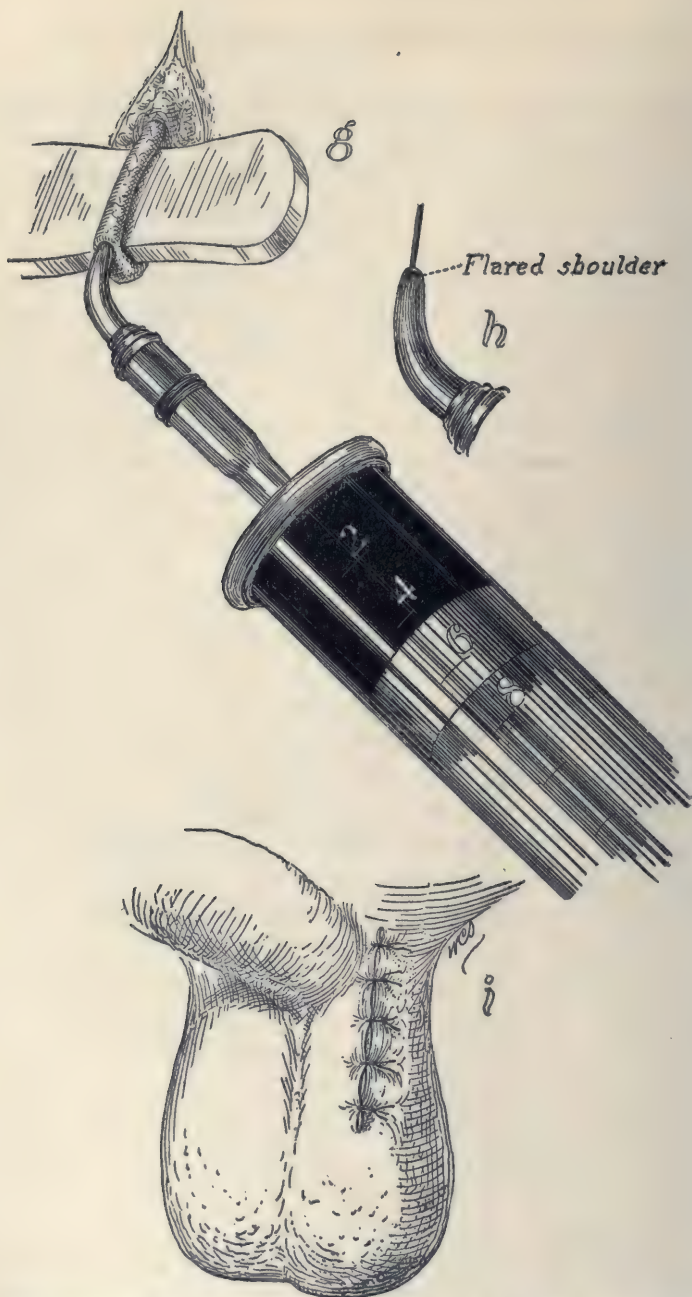


Fig. 138.—*g*, Injection of collargol into vas; *h*, needle point used on Record syringe. Note shoulder which prevents back flow during injection; *i*, incision in scrotum closed.

he will be subjected to the usual tests to determine that the infection in the vesicles has terminated. This is accomplished by examining several expressed smears, both with and without silver nitrate provocation, and examination of at least one ejaculated specimen of semen. This operation is not infallible, but it is successful in a good proportion of these cases, which in the past we have not been able to relieve by the older methods.





# SURGICAL CLINICS OF CHICAGO

Volume 3

Number 3

CONTRIBUTION BY DR. ROY L. MOODIE

DEPARTMENT OF ANATOMY, UNIVERSITY OF ILLINOIS,  
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## STUDIES IN PALEOPATHOLOGY: ANCIENT SKULL LESIONS AND THE PRACTICE OF TREPHINING IN PREHISTORIC TIMES

*Summary:* Nature of skull lesions modified by shape of skull. Known lesions: fracture, tumor, necrosis, sinusitis, perforations. Trephining the most ancient and highly developed of all surgical practices, most highly developed in France in Neolithic times, and in later times in Peru. Trephining not an accompaniment of culture. Nature of the trephine opening. Methods of procedure: cutting, sawing, scraping, and boring—28 per cent. of operations in Peru performed for relief of fracture. Some knowledge of aseptic surgery possible—many of the trephine openings healed without infection.

THE shape of the skulls of ancient animals modified greatly the nature of the fracture or other injury to which this organ was liable. Thus the oldest known skull fracture, that of an ancient Triassic phytosaur (Fig. 139), does not involve the brain case at all, but is confined to the snout of this early reptile. The group of animals to which this creature belonged was, in appearance, much like the modern crocodiles, although structurally quite different. The nostrils (Fig. 139) were located far back toward the eyes, and the long snout was doubtless used in probing in the mud of the ancient rivers and lakes for burrowing shell-fish or other animals, and the long terminal teeth were useful in extracting the prey from the mud. This particular creature, whose skull is shown herewith (Fig. 139) in the act of turning over a large stone or log, had the misfortune to fracture its snout as indicated in the fossilized skull. The lesion was a long time in healing, having become badly infected by the bac-

teria of the ancient river bed, as shown by the large necrotic sinus on the dorsal aspect of the callus surrounding the fracture. This fracture, with an antiquity of twenty million years, initiates our knowledge of skull lesions of past time.

The next oldest fracture is that of the mandible of one of the giant, heavily armored, three-horned Dinosaurs, known as *Triceratops*. The fracture had healed with the formation of little callus and there is no indication of sepsis. This lesion has an antiquity of seventeen million years.

The lesion which next attracts our attention as we ascend the geologic scale is that of the mandible of a three-toed horse, *Merychippus campestris*, from the Miocene, having an age of



Fig. 139.—Skull of an ancient reptile, a phytosaur, *Metriorhynchus plieningeri*, 25,000,000 years old, showing on the snout the oldest known skull fracture, which had healed, with the formation of considerable callus. The specimen is from the Triassic of Europe.

one million five hundred thousand years. The left ramus shows a distinct swelling, indicating the presence of a large fistula, possibly *actinomycosis*, in its early stages. This fistula is accompanied by alveolar osteitis, resulting in the absorption of the alveolar margin, and pyorrhea possibly was present in the gingivæ.

Our knowledge of further head injuries or infections for the succeeding million years is a blank, and we must look to the animals of the Pleistocene to study further ancient skull injuries. Here, in the period immediately preceding our own, are known two skulls which show very definite injuries. One is an early Pleistocene bull, *Mastodon americanus*, whose skull (Fig. 140) had been badly fractured in a fight or possibly by a falling



tree. This injury fractured only the outer skull table, and since the diploë is several inches thick there was no succeeding endocranial affection. In the left temporal fossa, also, there is a large necrotic sinus into which one may pass his hand to a depth of several inches, although this did not apparently penetrate beyond the inner table.

Muskoxen, now restricted to the northern portions of Canada, in Pleistocene times wandered over the greater share of the



Fig. 140.—Skull of an old bull, *Mastodon americanus*, possibly 100,000 years old, showing on the right occipital region an extensive skull fracture, partially healed, and in the right temporal fossa a large necrotic sinus. The skull is in Yale University Museum, and is from the Pleistocene of New York.

North American continent, and like their successors of today doubtless indulged in fights with their sharp, heavy horns. A male skull (Fig. 141) found in Michigan shows a large necrotic sinus penetrating into the maxillary sinus, and doubtless the creature was afflicted with a chronic suppurating sinusitis, possibly due to a sharp blow from the horn of an opposing bull.

This brief review completes our knowledge of skull injuries

prior to the advent of man. All skull injuries of ancient man, apparently, were inflicted by human instruments; some by the instruments of war, such as the ancient skull described by Ameghino, and called by him *Diprothomo platensis*, which shows a perforating injury of the left frontal bone, doubtless produced by a stone arrow point.

**The Antiquity of Trephining.**—Man first performed trephining many thousands of years ago, and skulls with three or



Fig. 141.—Skull of a muskox, *Symbolus cavifrons*, possibly 80,000 years old, from the Pleistocene of Michigan, showing (at the arrow) a lesion possibly indicating a chronic suppurating sinusitis. The skull is preserved in the University of Michigan.

even four large trephine openings are known from the Neolithic period, with an antiquity of possibly twenty-five thousand years.

A study of the primitive art of trephining, or trepanning, is a phase of paleopathology which deserves recognition, since the operation was doubtless performed for the relief of some form of injury or disease of the head or brain, and also because the operation itself was a traumatism, often of a very serious and frequently fatal nature. The mortality rate, based on very inexact data, for trephining among primitive and prehistoric peoples has been estimated at between 50 and 75 per cent., while

the modern mortality rate, as given by Krause, is low, possibly 15 to 18 per cent. being the average. In the middle of the last century before the advent of asepsis Dieffenbach regarded trephining as a certain means of killing a patient. Later Leser reported 36 cases of trephining for injury to the skull without a death traceable to the operation itself. However, death is likely to ensue from collapse of the brain and severe hemorrhage of the diploë, since, often in prehistoric times, extensive plaques of bone were removed.

Trephining or trepanning the skull was an operation frequently performed ten thousand or more years ago, in Neolithic times, especially in western Europe and in Bohemia. The first prehistoric trephined skull was found in Cocherel, France, in 1685, and the subject has attracted considerable attention from anthropologists, who began an active discussion of the subject in 1872, when Prunières, Broca, and others initiated the subject. Evidences of its practice in early times are also found in Bolivia, Peru, Michigan, Mexico, and Central America, although none of these evidences are of Neolithic age. There is no evidence of the operation being performed by either the Hindoos or Chinese, nor among the Greeks and Romans. A single doubtful example of trephining is figured by Sir Marc Armand Ruffer from the early graves of Egypt. Some trepanned skulls have been discovered in Gaul, belonging to an epoch corresponding to that of the Roman civilization. The regions where it received the greatest attention in ancient times were Peru and France.

The contemporary hill-tribes of Daghestan, the natives of Tahiti, the Polynesians, and Loyalty Islanders, the Kabyles (Fig. 148) of Algeria (but not the Arabs or Negroes in contact with them), the Montenegrins, and the Aymara Indians of Bolivia and probably in the highlands of Peru still perform this operation, and thus express their belief in its efficacy. The native tribes are very secretive about their procedures, and little is definitely known about their methods, although Bandelier in Bolivia, and Hilton Simpson in Kabylia, North Africa, have been so fortunate as to observe the operation.



The operation in Bolivia is performed by the shaman, who is often also a medicine man, with a well-sharpened pocket-knife, a piece of sharp glass, or sharp-edged stone, the process being one of cutting and scraping. The operation is often performed following a depressed fracture of the skull received in one of the frequent brawls of the Indians on feast days when quantities of intoxicating liquors are consumed. Many of the



Fig. 142.—Skull from a Neolithic sepulchre in France, which had been trepanned in three places. The patient recovered from at least two of these operations, since the margins of the openings are healed over. (After Baudouin.)

recent Bolivian skulls show evidences of more than one operation, and as many as four are known to have been made with success. The openings are large and rudely made, and the operation, fatal in a high percentage of cases, must have been excruciatingly painful. The plaques of bone, after being pried out, were not replaced, but a mass of grass or any dirty, greasy cloth in reach was often inserted under the scalp, with consequences which one shudders to consider.

Common and wide-spread as trephining (Fig. 142) was in Neolithic times, yet very little is known of its purpose or the method of procedure of the prehistoric surgeon, save by comparison with modern methods, as used by primitive peoples. Broca decided that prehistoric surgical trephining was performed for the relief of certain internal maladies. He suggested that it was performed on young epileptic or mad persons to rid them of the "genius," the "demon" causing the dreaded symptoms. They may have performed the operation for the relief of depressed fractures, but as many of the trephined skulls show no sign of accidents, headaches are very probably to be considered

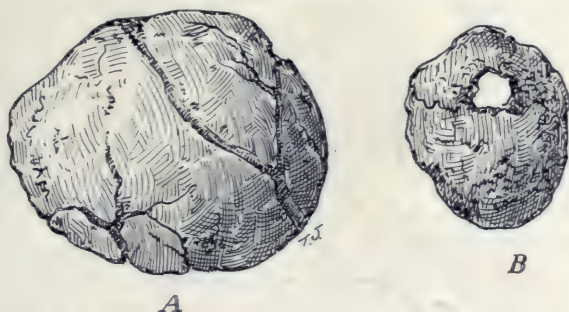


Fig. 143.—Cranial amulets or "rondelles" possibly taken from trephine opening in the living, but more probably derived from dead skulls. These are supposed to have been used as charms, and often perforated (B) and worn as a necklace. (After Fletcher.)

an important indication for this operation. A religious significance has been attached to the procedure, but there is no recent evidence to support this view. A large percentage of the ancient Peruvian skulls were trephined for the relief of fractures, either depressed or linear.

The trephine hole is usually located on the upper and posterior part of the parietal bone,<sup>1</sup> probably because this region was most easily accessible to the operator in a period when beds and chairs were not used. In Bolivia the patient sits or reclines

<sup>1</sup> Two Neolithic skulls described by Manouvrier were trephined, one in the temporal, the other in the posterior part of the frontal. One of the skulls described by Prunières is trephined in the right occipital. Several of the Peruvian skulls are trephined in the frontal.

against a mossy bank, or the head is supported on the knee of the operator. The operation, according to Lucas-Championnière (Fig. 145, *B*, *C*, *D*), was not performed by scraping, since this would take a long time, would result in profuse hemorrhage, and would not result in the production of a *rondelle* or cranial

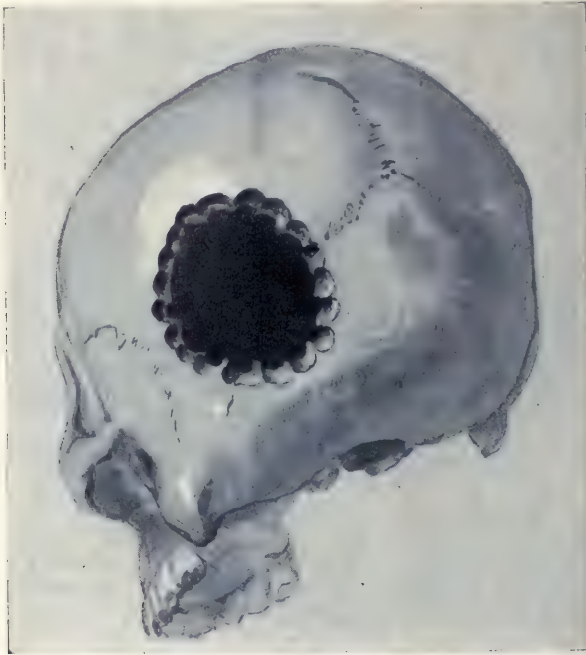


Fig. 144.—Trepanned opening of the skull of an ancient Peruvian mummy, at the Trocadéro Museum, Paris. When discovered the skin covered the opening like an operculum. On the basis of this skull Lucas-Championnière formulated his hypothesis of prehistoric trephining as outlined on a later page. This is the only example of a Peruvian skull known with this type of opening. (Drawn from a photograph by Professor Verneau.)

amulet (Fig. 143) so prized by prehistoric peoples for wearing (Fig. 143, *B*) as a necklace, but was doubtless produced by a sharp cutting or sawing instrument, similar doubtless to the methods employed by the New Caledonians (Fig. 148) today, and by the ancient Peruvians, who probably used a notched knife or saw of bronze (Fig. 146, *A*, *B*).



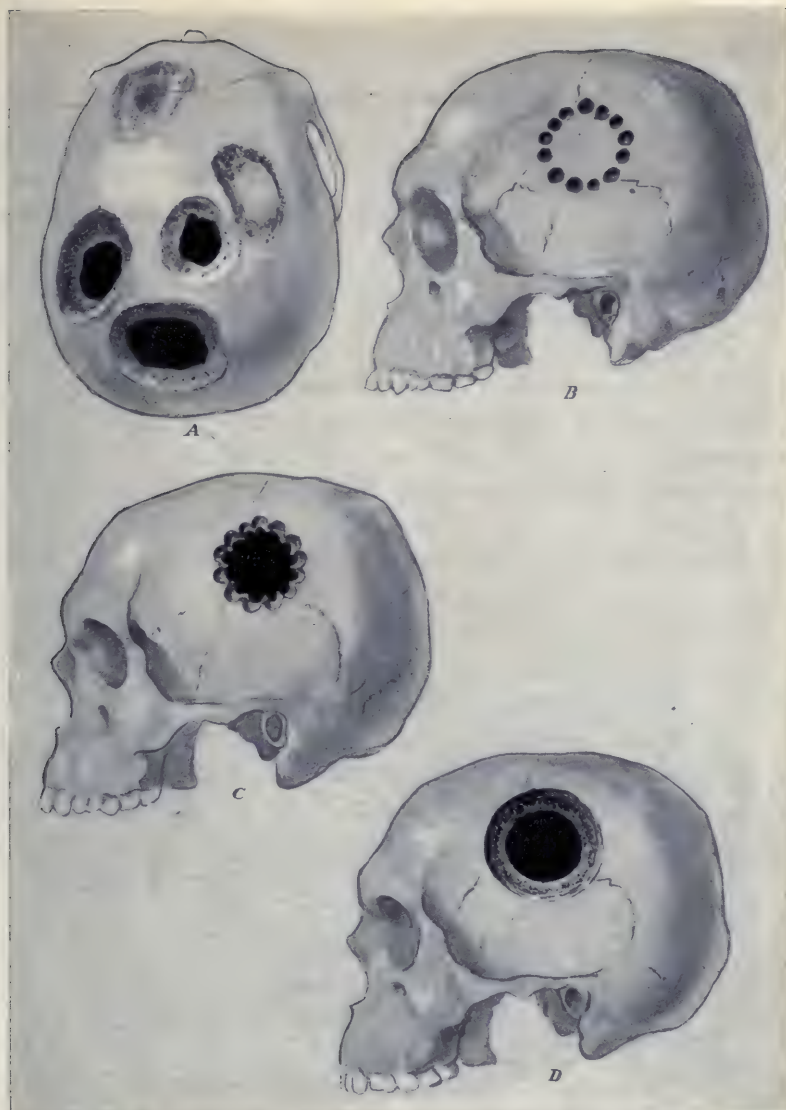


Fig. 145.—A. A very unusual ancient Peruvian skull showing five trephine openings, two of them incomplete. Edmundo Escomel, of Arequipa, Peru, who described this skull and from whose photograph the figure is taken, says: "There are on this skull three series of trepanations in different stages of repair." It will be noted that the incompleting openings show no evidences of a drilled margin, but appear to be due to scraping and cutting. B. A scheme on a modern skull outlining the hypothetic placing of borings as devised by Lucas-Championnière. C. The rondelle or plaque of bone removed. The resemblance of this opening to the trephined skull in the Trocadéro Museum is evident. D. The crenated margin removed by chiseling, with the result so commonly seen in prehistoric trephined skulls.

The operation was often performed several times on the same individual, and Neolithic skulls are known with three or four trephine openings (Fig. 142). Its frequency is suggested by the discoveries in the Neolithic sepulchral chambers at Vendrest, some sixty miles to the east of Paris. Remains of over 120 individuals, representing both sexes and all ages, were found within this ancient tomb. A fall of earth and rocks had buried the doorway of the sepulchre about the close of the Neolithic period, for all the worked flints and ornaments found within the sepulchre were of that age. No less than 8 skulls had been operated by trepanning, and many of them had survived the operation as seen by the healing of the edges of the wounds, a process of extreme slowness in the skulls of adults.

**Trephining in Ancient Peru.**—The antiquity of the surgical procedure of trephining in western Europe has been discussed above, and it remains to be told here to what a high degree of frequency (Fig. 147) it was performed in the Western Hemisphere, especially in Peru; some of the probable causes for this operation and the basis on which the conclusions rest.

A skull, probably trephined postmortem, was discovered at Chaclacayo, near Lima, Peru, and described by Otis Mason. It is easily possible that the operation may have been fatal, since there are other skulls, such as the one described by Escomel,<sup>1</sup> which shows that after two successful (Fig. 145, *A*) operations the third was fatal. Many of the operations (Fig. 147) seen in the skulls of the Muniz collections were performed during life. Many of the skulls illustrated in this collection<sup>2</sup> show good recovery and partially healed wounds, but the percentage of pre- and postmortem operations in Peru has not been determined. The indications for the operation as outlined by Tello of Lima are: (*a*) an antecedent fracture; (*b*) a simple traumatism of the cranium which denuded the periosteum, followed or not by an inflammatory process; (*c*) a circumcised periostitis or osteoperi-

<sup>1</sup> Edmundo Escomel: Un caso interesante de trepanacion incaica, *La Crónica Medica*, Lima, 1916.

<sup>2</sup> Muniz, M. A., and McGee, W. J.: Primitive Trephining in Peru, 16th Ann. Rep. Bur. Amer. Ethnology, Washington, 1897.

ostitis, perhaps also of traumatic origin; (*d*) lesions possibly of a syphilitic nature. Some doubt has been expressed as to the age of the specimens described by Tello, and especially is the nature or even the existence of pre-Columbian syphilis in doubt.

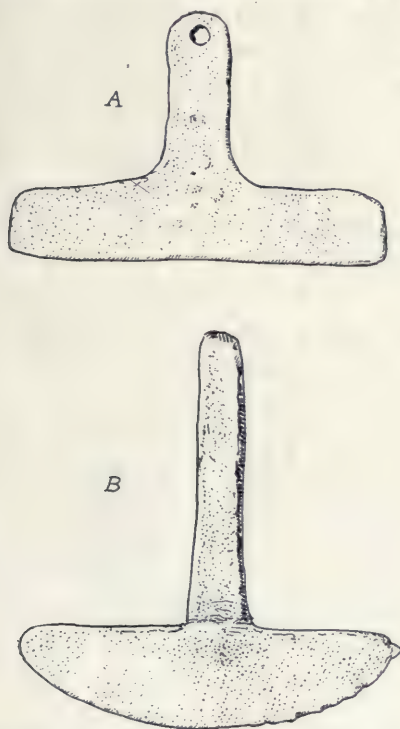


Fig. 146.—Ancient Peruvian knives of bronze. *A*. Bronze knife, with pierced flat handle, slightly marred. *B*. Bronze knife with heavy square-sectioned handle. Incomplete. These knives were discovered and figured by Dr. George F. Eaton, of the Yale University and National Geographic Society Expedition to Peru. They are possibly similar to the ones used by the ancient Peruvian surgeon in trephining. Where the openings show evidence of sawing one of these knives with a notched edge may very well have been used.

Syphilis in ancient Peru, as well as in modern times, has been confused with yaws and with uta or leishmaniasis, the existence of which in ancient Peru is recorded on Incan water-jars described by Palma and Tamayo. Bone lesions in Peru of known pre-Columbian age which can be accurately ascribed to syphilis are not known, but after the invasions of the Spaniards,



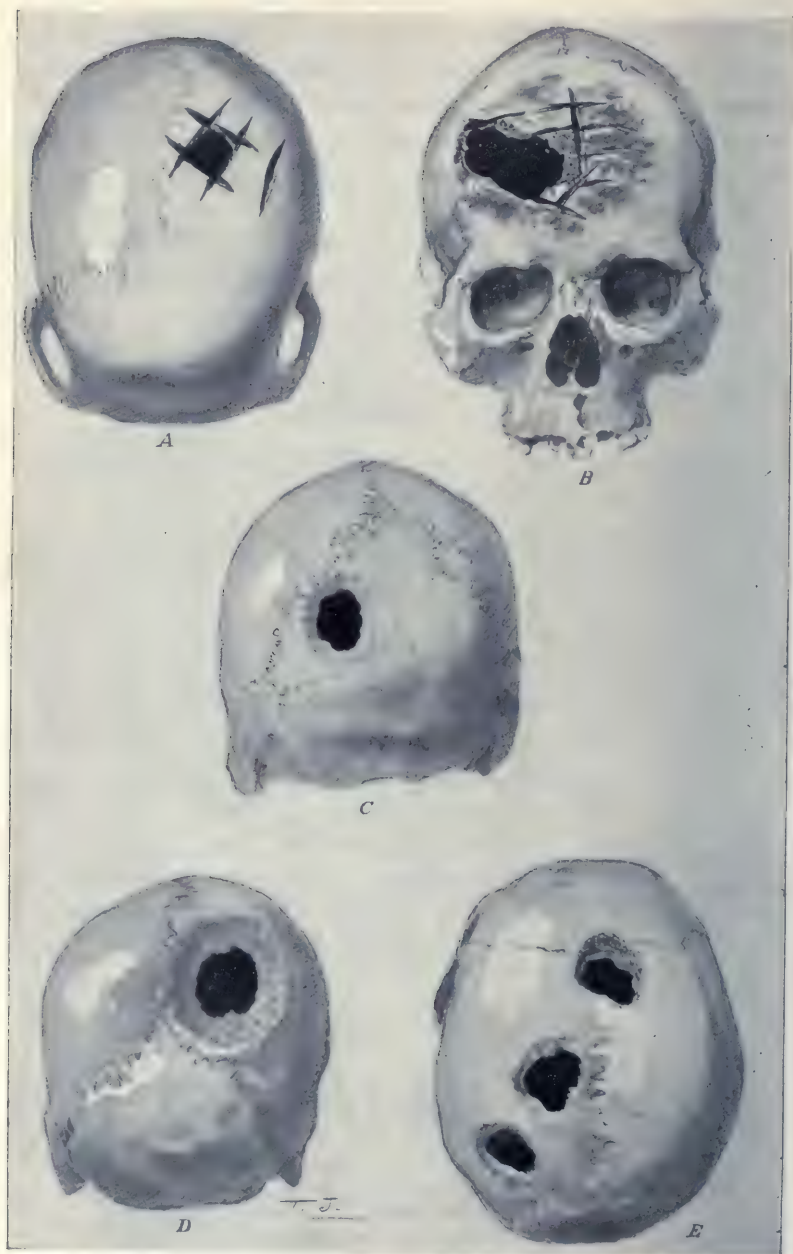


Fig. 147.

after 1530, syphilis became wide-spread throughout the mountainous districts of Peru.

The openings made in trephining the skull were of various shapes and sizes (Fig. 147), and doubtless the operation varied greatly as to nature of the opening. Lucas-Championnière<sup>1</sup> has suggested, and has demonstrated (Fig. 145, *B, C, D*) his suggestion by an experiment, that the rounded openings were produced by boring a succession of holes with a rounded flint or bronze knife (Fig. 146) and then the plaque chiseled out (Fig. 147, *B, C, D*). Many skulls, such as the one secured in 1873 by Squiers, show definite evidences (Fig. 147, *A, B*) of being produced by a sawing instrument (Fig. 145, *A, B*) and some of them indicate that the operation was produced by scraping. A series of figures (Fig. 147) show the types of openings produced.

The practice of trephining among the Peruvians in pre-Columbian times may have spread from Peru northward to Mexico and Central America, though there is little other evidence to point to the mingling of the Inca, Nahua, and Aztec cultures. Lumholtz and Hrdlicka,<sup>2</sup> however, have recorded cases of trephining among the ancient Tarahumares of northern Mexico. The practice of trephining among the modern Indians of Mexico is unknown. The skulls found in Michigan have trephine per-

<sup>1</sup> Lucas-Championnière: *Trépanation néolithique, trépanation pré-Colombienne, trépanation des Kabyles, trépanation traditionnelle*, Paris, 1912.

<sup>2</sup> C. Lumholtz and Ales Hrdlička: *Trephining in Mexico*, *Am. Anthropol.*, Wash., 1897, x, 389-396, two pl.; C. Lumholtz: *Unknown Mexico*, 1902, 328, two figures.

Fig. 147.—Ancient Peruvian skulls showing different types of openings: *A*. Skull opened by a saw or notched knife. An attempt at a second opening was made to the right of the completed opening. *B*. Skull showing very crude opening in the right frontal, with a large plaque of bone removed, after several abortive attempts. The darkened areas around the opening are doubtless due to a large blood-clot. It is very doubtful if this individual survived the operation. *C*. Skull with small, rounded trephine opening in the left occipital region. The patient survived the operation for many years, since the margins are completely healed. *D*. Skull with large rounded trephine opening in the right parietal. The margins slope greatly and indicate some scraping process. *E*. Skull with three moderate trephine openings on the vertex. (All figures taken from Muniz and McGee, *Primitive Trephining in Peru*, Smithsonian Rept., Washington, 1894-5.)

forations, but, unlike the usual trephined skulls, there is but a single opening, and that in the vertex, suggesting the postmortem perforations practised by the South Sea Islanders in order to hang on a string the skulls of their enemies overcome in battle.

**Origin and Significance of Trephining.**—A significant feature of the geographic distribution of the ancient and primitive peoples who practised trephining shows that it was not an accompaniment of culture and learning. It did not occur among the Greeks, Romans, Phœnicians, Babylonians, or Egyptians. Among these people our modern civilization had its origin.



Fig. 148.—A modern trephined skull of an inhabitant of Kabylia, north Africa, showing incomplete results. (After Professor Verneau.)

Among the ancient Egyptians there have been a few cases ascribed to trephining. Thus, G. Elliot Smith in 1910 recorded a skull with a depressed fracture resembling a trephine opening; Derry described a skull (Fig. 149) which shows a clearly marked circular opening, which, though it resembles a trephine opening, may be interpreted as a parietal perforation due to a dermoid cyst of the scalp. Dr. Ruffer has figured a skull which he is inclined to think may be a case of trephine, but there are no definite clear-cut examples, and certainly the practice was not so wide-spread as it was in western Europe and in Peru.



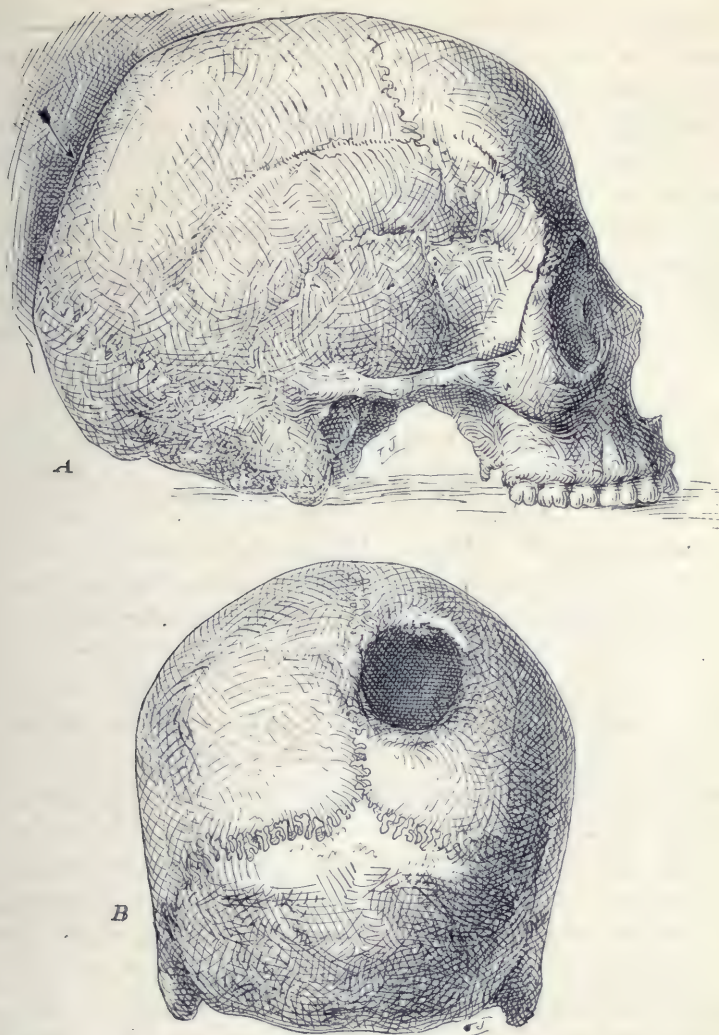


Fig. 149.—A skull from Shurafa, Lower Egypt, found in a cemetery of Roman date, about 2000 years old, of a young woman about twenty-one years of age. *A*. Right lateral view, showing remarkable parietal flattening, the position of the opening (at the arrow), and the perfect condition of the skull. *B*. Posterior view, showing perforation suggested to be due to a dermoid cyst, and simulating a trephine opening. (Drawn from photographs by Derry.)

Trephining arose among the ignorant, cave-dwelling, skin-clad hunters of the western part of Europe, who built no fine

temples and palaces as did the ancient Egyptians and Greeks. They were crude and did not cultivate the love of the beautiful as did the ancient Peruvians. Here, among an uncultivated, uncultured, and superstitious people, hindered in their intellectual development by the great Ice Age which afflicted their country in four periods, the practice of the art, so common today, arose and spread among the adjacent peoples. Its significance, at first, may have been due to a superstition. Certainly it could not have been based on reason and an understanding of what they were doing.<sup>1</sup> How the Peruvians thousands of years later acquired, or developed, trephining we do not know, since there is no known communication between the Stone Age periods of America and Europe save through a roundabout route involving an enormous and incredible transit of the culture through Alaska. Markham has suggested that the Peruvians have inhabited their section of South America since 1300 B. C., but there is little evidence to support his suggestion.

The practice of trephining surpasses in antiquity and in perfection of technic all other surgical arts of prehistoric peoples. The setting of fractured bones in splints was known among the ancient Egyptians. A jaw from the old Empire of Egypt, described by Hooten, shows clearly that an early surgeon perforated the mandible to drain an alveolar abscess.<sup>2</sup> Certain skulls from Bolivia and Central America show that the teeth had been perforated and fitted with a porcelain inlay, but there is no evidence of prophylaxis playing any part in the procedure, but the work was probably an attempt to beautify the features.

<sup>1</sup> There is some evidence to show that the ancient Peruvians especially developed the art by practising on dead skulls, and reached their conclusions by experimentation. They often used plaques of gourd or pieces of metal to cover the opening, and they doubtless carefully bound up the opening with healing herbs, pitch, or gum. MacCurdy suggests that the ancient Peruvian surgeons possessed some rudimentary knowledge of asepsis, since the embalming substances used by them in the preservation of the dead, such as Baume de Perou, menthol, salt, tannin, alkaloids, saponines, and resins, are of an antiseptic nature. There are a few indications that successful transplants of bone were made in the skull, but its connection with trephining is not determined.

<sup>2</sup> E. A. Hooten: *Oral Surgery in Egypt during the Old Empire*, Harvard African Studies, 1917, Cambridge, 1, 29-32, one plate.

## CLINIC OF DR. DANIEL N. EISENDRATH

### COOK COUNTY HOSPITAL

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## INJURIES OF THE JOINTS IN WAR AND IN CIVIL LIFE<sup>1</sup>

*Summary:* Brief review of the pathology of the various forms of war injuries of joints and of the principles underlying their treatment. Presentation of 4 cases illustrating how the experience acquired during the war may be applied to the treatment of compound joint injuries in civil life, with especial reference to primary suture, Carrel-Dakin treatment, and early mobilization. Additional remarks on re-education and rehabilitation by Mrs. Minnie S. Sigsbee.

WE will take up joint injuries today, and to illustrate the subject I desire to present 4 cases which show all degrees of such injuries. In two of the cases I have applied three of the methods which surgical experience during the present world war has brought to our attention. These methods are the primary suture of wounds, the Carrel-Dakin treatment, and early mobilization of infected joints. Before showing the patients let us define some of the terms employed in speaking of injuries of the joints, and then review some of the lessons in the war surgery of such lesions which we have been recently taught. In the surgery of civil life, joint injuries are divided into two primary groups: (a) Simple or closed, in which there is no communication between the seat of injury and a wound in the adjacent parts. (b) Open, compound, or penetrating injuries, in which, as in the analogous open or compound fractures, there is a more or less direct communication between the seat of injury in the surrounding soft tissues and skin and the cavity of the joint.

Cases of simple or closed injuries in the first group, which are encountered in our surgery of civil life, differ so little from those seen in war that I will omit their discussion in the present

<sup>1</sup> This clinic was given on July 22, 1918, to members of the Medical Corps, U. S. Army.



clinic. Sprains, with laceration of one or more of the ligaments which reinforce the capsule of a joint, sprain fractures, in which a spicule of bone is torn off in connection with ligamentous injury, and injuries belonging to the subgroup of internal derangements of joints, and finally, closed fractures of the diaphysis or epiphysis of a bone extending into the joint cavity, present the same symptoms whether incurred during war or in civil life, hence I will direct your attention exclusively to the second group.

Compound injuries of the joints as they are encountered in civil life can be divided as follows: (a) Contused wounds of the adjacent soft parts communicating either directly with the cavity of the joint or indirectly through the medium of a bursa lying over the joint. The crushing injury (contused wound) of the peri-articular tissues may or may not be complicated by a fracture of the shafts or articular ends of the bones entering into the formation of the joint. (b) Incised, lacerated, or punctured wounds of the adjacent soft parts communicating directly or rather extending into the joint cavity. I have seen at rare intervals such wounds of the soft parts which did not communicate with the joint cavity at the time of injury, but, having become infected, the joint became involved secondarily. (c) Gunshot wounds. In civil life, revolver or rifle wounds constitute practically the only form seen. As in war injuries the missile may traverse the joint and emerge, constituting a through-and-through injury, or the bullet may lie free in the joint (rare except in the knee), or it may be lodged in the diaphysis or epiphysis of one of the bones entering into the formation of the joint.

Let us next classify the compound war injuries of the joints and compare them with the similar group in civil life. War injuries of the joints differ from those of civil life in two ways: first, the greater amount of destruction caused by the various forms of projectiles employed at the present day, and second, a greater tendency to become infected, owing to the fact that the soil of northern France and Belgium has been fertilized with animal excreta for centuries, and hence abounds in bacteria,

especially those found in the alimentary canal of the domestic animals. The gravity of these war injuries depends upon:

(a) The nature of the projectile and of the particles of clothing carried in by it.

(b) Certain mechanical difficulties owing to the anatomic fact that many of the joints are composed of a series of cavities formed by the intra-articular ligaments and the conformation of the articular ends of the bones entering into the formation of the joint.

(c) Fissures and comminution of the articular ends of the bones, *i. e.*, the epiphyses, which favor the retention of infection.

Infection in both war and civil injuries of joints enters in one of four ways:

(a) Carried in by the bullet or shell fragment, especially on particles of clothing.

(b) An infected fissure in the shaft or in the articular end or an infected bursa (as in Case II) over the joint permits infection to enter the joints.

(c) A peri-articular infection of the soft tissues invades the joint by contiguity. (This occurred in Case I.)

(d) The joint is infected through a lacerated or incised wound which extends through the capsule, *e. g.*, when a bayonet, knife, piece of glass (see Case III), or other agent penetrates the joint at the time of original injury or the joint capsule is lacerated, as occurred in Case IV. Metastatic infection of an injured joint occurs so seldom that it needs only to be mentioned.

In considering the pathology of joint injuries both in war and in civil life it is well to recall certain important facts. The synovial membrane, like the peritoneum, will take care of a moderate amount of infection. There is, again, analogous to our experience with other serous membranes, a great tendency for the infection to become localized. The tissues for a distance of 1 cm. from the tract of the projectile are devitalized and offer an excellent medium for the growth of pyogenic organisms. If this tract can be excised within the first twelve hours, and all foreign bodies removed, including particles of clothing and missile and all completely separated fragments of bone, the joint

injury may be converted into a simple one by complete primary suture of each layer. For the first twelve to twenty-four hours the infection is limited to the tract of the projectile, but after this the synovial membrane and the effused blood become infected. As soon as the joint itself is invaded pathologic changes take place rapidly. The endothelium of the joint surface is replaced by granulation tissue, then the underlying cartilage becomes eroded, adhesions form, and either fibrous or bony ankylosis results. I have outlined this sequence of pathologic changes because only one who fully understands the rapidity with which they follow each other can appreciate how easily infection of a compound injury of a joint may produce almost irreparable damage.

**Varieties of War Wounds of Joints.**—These can be divided into the following groups:

1. Through and through, no projectile being retained. This can, as a rule, only occur in the knee-joint, rarely in the shoulder.

2. Through and through without fracture, but with small or large shell fragment or a machine-gun or rifle bullet, lying either free in the joint (rare except in knee) or embedded in one of the articular surfaces or the diaphysis (shaft) and communicating with the joint.

3. Large wound of entrance or of exit, or both, associated with a fissure in the bone or with more or less comminution of the articular ends.

4. Crushing injuries of the articular ends with involvement of the principal nerves and blood-vessels of the limb, necessitating early amputation.

**Treatment of War Injuries of the Joints.**—The consensus of opinion as to the best method of treatment at the present time is as follows:

*Class 1.*—Wounds by rifle or machine-gun bullets fired at a long distance, *i. e.*, without explosive action. (*a*) With through-and-through wounds it is best to pursue a conservative course. Do not operate even though there is a fracture into the joint. The joint should be mobilized as soon as reaction ceases, and if the bullet is embedded in the bone it is best to remove it after



all reaction has subsided. (b) In cases with much loss of soft tissues or comminution of bone, primary or primary delayed suture, even a partial primary, is indicated, and has resulted in over 75 per cent. of primary union. I have just described under the head of pathologic changes what is understood by primary suture. It now remains to explain that by primary delayed suture is meant nearly the same as primary suture, but the synovial membrane alone is closed, and the other tissues are closed at a later date. Drainage is inserted temporarily down to the sutured capsule, but not through it.

*Class 2.*—Wounds by shell, grenade, or bomb fragments. If the case is seen within the first twelve hours, primary or primary delayed suture should be done and mobilization begun on the next day, unless much muscle tissue has been torn, then one should wait five or six days.

Even if there is much damage to the soft parts and bone, one must try to do a primary suture as long as a fair articular surface remains. If the soft parts cannot be closed completely, a partial primary suture may be tried.

In the first two years of the war resection was almost the rule, but it is only permissible at present if the damage to the soft parts and bone are so severe that a functioning joint is impossible. Amputation is only indicated, as I have stated before, when the principal nerves and blood-vessels are destroyed, or in cases of infection (especially of the knee) which cannot be controlled.

The great advantages of primary or primary delayed or partial primary suture in war surgery have become more and more evident as the percentage of success has risen, until at the present time not to attempt such a primary closure would merit severe criticism. The second great principle which war surgery has taught us in the treatment of injuries of the joints is the employment of early mobilization.

Williams in 1909 advocated immediate mobilization after injuries of the joints, and in 1917 he extended its use to infected joint injuries. I have had but one experience (see Case IV) with active mobilization in purulent arthritis, but Pool, Lee and

Dineen (Surg., Gyn., and Obst., 1918, 27, 289), and others have had excellent results and strongly endorse the position of Williams. I shall refer later to the application of early mobilization to joint injuries in civil life in connection with Case IV. The third advance in our methods of treatment which this war

has taught us is the Carrel-Dakin treatment, and I shall describe its use in infected joint injuries in connection with the same case.

Let us now examine the 4 clinical cases and note how the experience of war surgery has been applied in the last two.

CASE I.—Compound fracture of olecranon process of right ulna followed by severe infection of elbow-joint. Carrel-Dakin treatment, followed by rapid subsidence of sepsis. Ankylosis of joint.

This man, aged forty-one, fell upon his right elbow from a wagon about twenty-four hours before admission to the hospital. Upon admission to the hospital the elbow region was found greatly swollen, red, and very tender. From a wound over the olecranon process there was a constant discharge of turbid

serum. *x*-Ray revealed a transverse fracture of the olecranon (Fig. 150) extending into the elbow-joint. Every effort was made to combat the infection which already existed, but without success. The temperature rose steadily, and it was soon apparent that we were dealing with a severe septic arthritis of the elbow. Under anesthesia we explored the region over the upper end of the ulna and found that the accident had been com-



Fig. 150.—Fracture of olecranon process from Case I. Note how line of fracture passes directly into elbow-joint, allowing of free communication between surface wound and interior of joint.

plicated by a traumatic olecranon bursitis which communicated directly with the seat of fracture, and this, in turn, with the cavity of the joint. I have referred to this in the early part of the clinic as being one of the possible modes of entry of infection in compound joint injury. In order to secure proper access to all parts of the joint for our Carrel instillation tubes the upper fragment of the olecranon was removed and the treatment begun which I will describe more fully in connection with Case III. A glance at the temperature chart (Fig. 151) shows how rapidly we were able to conquer the infection in the joint. At

COMPOUND FRACTURE OF OLECRANON—SEPTIC ELBOW JOINT

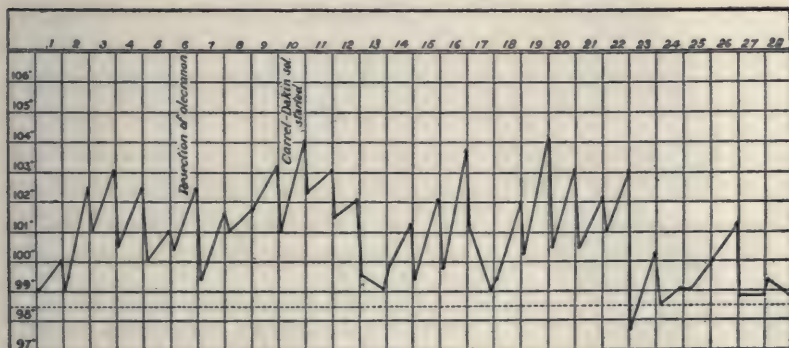


Fig. 151.—Temperature chart from Case I of compound fracture of olecranon process complicated by septic elbow-joint.

this time my attention had not been called to the great advantages of the Willems method of early mobilization of such infected joints. The result is a fibrous ankylosis in a favorable position—*i. e.*, the elbow flexed to a little less than a right angle with the forearm semipronated. After I read of Willem's work on the importance of early mobilization I felt that such an ankylosis should not have been our final result, especially after we had succeeded so rapidly in controlling the infection in the joint.

**CASE II.**—Very severe and extreme crushing injury of soft tissues over outer aspect of elbow-joint, which was treated by Carrel-Dakin method. Rapid fall in pulse and temperature followed by ankylosis of elbow.



This patient (male, aged thirty) was run over by a motor truck, the wheel passing over the outer aspect of the right elbow. Upon admission an area of contusion was to be seen extending through all the soft tissues from the middle of the radial side of the forearm to the level of the junction of the upper and middle thirds of the humerus on its outer aspect. *x*-Ray examination revealed a fracture extending from a point above the external condyle obliquely downward through the middle



Fig. 152.—Fracture of external condyle of humerus in Case II. Note how the line of fracture passes directly through the entire surface of the humerus through the elbow-joint.

of the articular surface of the humerus (Fig. 152). I advised conservative treatment of the contused area, *i. e.*, painting it and the surrounding skin with tincture of iodine and the application of a dry sterile dressing. Had I employed the method of debridement or radical resection of all contused tissues which the present war has demonstrated as of such great value, I would have anesthetized the injured man immediately upon admission and have resected all the contused, devitalized tissue. This serves as a medium for the growth of pathogenic organisms, and proved to be true in our case. The area over

the outer aspect of the elbow began to show evidences of gangrene, and the gradual but steady onset of the symptoms of a generalized sepsis showed that the infection had extended through the gateway offered by the devitalized tissue and fracture directly into the elbow-joint. Free drainage was provided by resection of the joint surfaces, and then several of the instillation tubes to be described in connection with Case III were inserted. The brilliant results secured in this case from the application of the Carrel-Dakin treatment are best seen by a glance at the tem-

perature chart (Fig. 153). The septic arthritis was of a most severe and resistant type, but the subsidence of the fever and other symptoms of sepsis soon convinced us that we were controlling the infection. In this case the criticism I have to make of our treatment is, first, that we were not more radical in the treatment of the crushed soft tissues, and second, that efforts at mobilization of the elbow were begun too late, the result being that the elbow has, as in the first case, become ankylosed.

I will now show a third case of severe elbow-joint injury in which we profited by our experience in the first two cases and

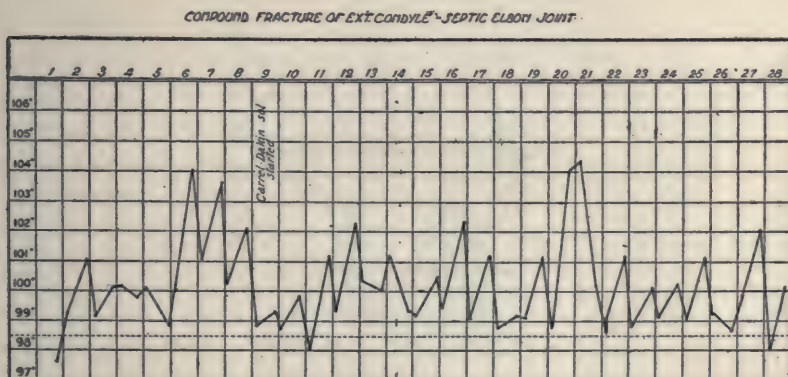


Fig. 153.—Temperature chart from case of compound fracture of external condyle complicated by septic condition of elbow-joint.

began active and passive mobilization at an early period after subduing the infection by the Carrel method.

CASE III.—Male, aged forty-five, caught in rapidly moving belting and carried to the top of a grain elevator. Crushing injury of right arm necessitating amputation near shoulder. Lacerated wound over left elbow, opening joint widely and followed by severe sepsis. Resection of elbow and Carrel-Dakin treatment with rapid subsidence of symptoms. Early mobilization followed by excellent function of elbow. Re-education of patient.

This man was caught, while working in a grain elevator, in some rapidly moving belting and carried to the top of the build-

ing. His right arm was so badly crushed that amputation close to the shoulder-joint was immediately performed. Over the left elbow was a lacerated wound extending into the joint, so that the articular surfaces were visible. I saw the patient for the first time two weeks after the accident and found him extremely septic as the result of a severe infection of the left elbow-joint. There was wide-spread suppuration in the soft tissues around the joint extending to the middle of the forearm below and almost to the shoulder in an upward direction. En-

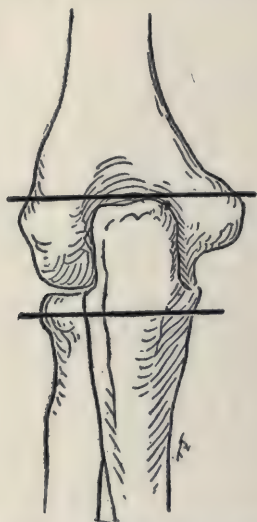


Fig. 154.—Posterior view of elbow-joint, showing the level of typical resection of elbow-joint, an operation which should be seldom performed for drainage of a septic arthritis.

ergetic action was needed to save his life, inasmuch as amputation has, in my experience, not been as efficacious in checking the sepsis as thorough drainage. I immediately resected the elbow (Fig. 154) and injected tincture of iodine into all portions of the joint, and as soon as possible inserted several instillation tubes and began the Carrel-Dakin treatment. The elbow was kept immobilized temporarily in an interrupted (Fig. 155) plaster cast. The wound healed very rapidly (Fig. 156). About five weeks after the injury active and passive movements were



begun. A very inexpensive and easily constructed apparatus (Fig. 157) with which to obtain active mobilization is constructed on the principle of the pulley-weight machine so popular in our gymnasiums. Within a few weeks he was able to flex and extend the elbow within the normal range of motion (Figs. 158-161). I was led to begin early mobilization of the



Fig. 155.—Plaster cast used in the three cases of septic elbow-joints spoken of in text. Note the fact that cast is solid on one side so as to permit of little motion during the early stages of treatment. Also observe how rigidity of cast is maintained by a U-shaped piece of band-iron incorporated in cast.

joint in this case after reading of the experience of Willems; and the result in this case certainly is a brilliant one compared to our former methods of treatment, as seen in the first two cases. We were soon confronted with the problem of how to prevent this man from becoming a burden to himself and to society. I invited one of our occupational therapy

teachers, Mrs. Sigsbee, to co-operate. Within three weeks she has taught the patient to write very legibly with his only remaining (left) hand, and to weave the baskets (Fig. 162) I now show you. She will tell you later of the work of rehabilitating such handicapped individuals.

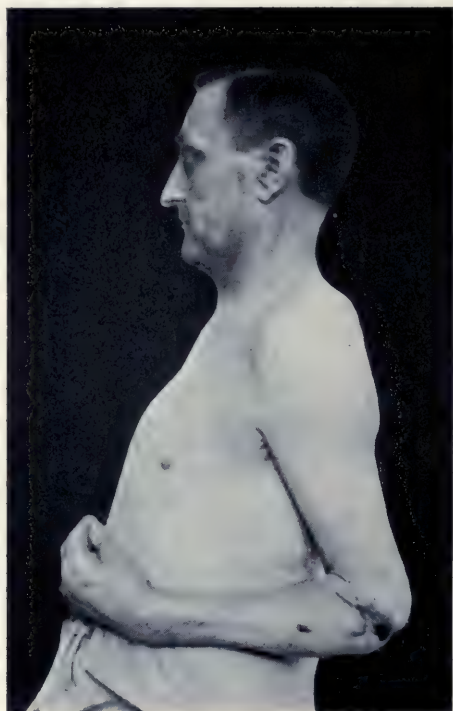


Fig. 156.—Side view of Case III, showing wound on posterior aspect of elbow-joint.

Before presenting the fourth case I desire to describe very briefly the principles and mode of application of the Carrel-Dakin treatment.

The Carrel method<sup>1</sup> makes use of a 0.45 to 0.5 per cent. solution of hypochlorite of soda (Daufresne-Dakin formula), the causticity of which has been thoroughly neutralized. It

<sup>1</sup> For further details see book by Carrel and Dehelly.

possesses a high degree of antiseptic power in the presence of tissue proteids. Owing to its hemolytic property one must be careful to secure good hemostasis on account of a possible secondary hemorrhage. The method is not one of continuous irrigation, but rather to deliver to every portion of the wound an antiseptic solution of a known strength. Objections have been raised because a painstaking surgical technic and the co-operation of a competent pharmacist or chemist is required. When one com-

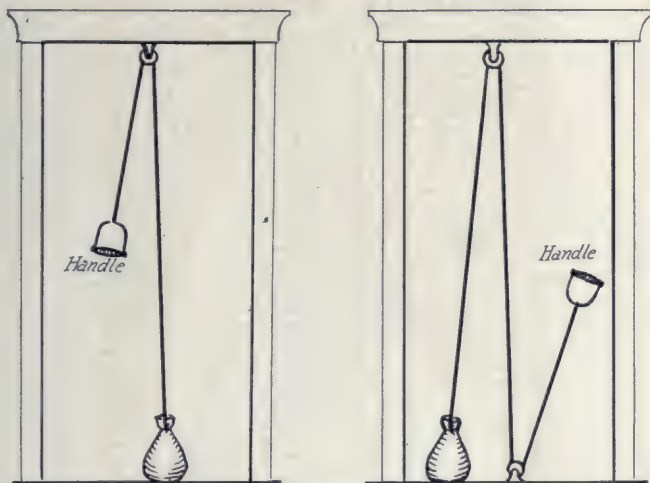


Fig. 157.—Simple apparatus used by author in early mobilization of Case III. This apparatus consists of a pulley inserted into a door frame, to one end of which a handle is attached, and to the other end a bag of salt weighing from  $\frac{1}{2}$  to 2 pounds or more, as is desired. The illustration on the left shows how this apparatus can be utilized for mobilizing the shoulder-joint, and the illustration on the right shows how it can be employed for mobilization of the elbow-joint if a second pulley is inserted into the threshold.

pares the results, however, obtained in the 3 cases I have shown with those obtained by any other method I feel confident that we have been richly rewarded. The careful arrangement of the instillation tubes and the necessity for strict asepsis cannot be too strongly impressed upon those who wish to be successful in the application of the method. The progress of sterilization of the wound is observed by the rough but sufficient method of counting the bacteria from smears of as uniform a thickness



as possible and in fields of uniform size. If the number of bacteria decreases to less than one per five fields and continues so for five successive daily counts, the wound may be considered sufficiently sterile for a secondary suture to be done. Often weeks to months are saved by this latter method, which consists



Fig. 158.—Front view of Case III, showing ability of patient to completely extend elbow-joint.

in either resecting the edges of the granulating surfaces and approximating them by sutures, or in resecting not only the edges but also the entire granulating surface before suturing. I prefer the first named of these methods of secondary suture. If the count is temporarily reduced by the Carrel method or remains persistently high, one must suspect the presence of a focus

which has not been sterilized. The materials employed in the application of the method are:

1. A solution of 0.5 per cent. sodium hypochlorite prepared by the Daufresne formula.
2. An amber flask<sup>1</sup> of 500 to 1000 c.c. capacity with rubber tubing to carry the fluid to the distributing tubes, which are of various types (Fig. 163).



Fig. 159.—Front view of Case III, showing ability of patient to completely extend elbow-joint.

3. A Murphy glass drip bulb to note the rate of flow of the solution with a pinch-cock on the rubber tubing (Fig. 164).

4. Instillation rubber tubes, tied at the end, with lateral openings made with a special punch. If one wishes to make these rigid, a piece of silver wire can be inserted. The above equipment is now kept in stock by every instrument house, and methods

<sup>1</sup> Many prefer to use a glass syringe with a large rubber bulb so as to force the fluid through under pressure.



Fig. 160.—Side view of Case III, showing degree of voluntary flexion of the elbow-joint. Note practically complete normal flexion of the joint



Fig. 161.—Front view of Case III, showing degree of voluntary flexion of the elbow-joint. Note practically complete normal flexion of the joint.



have even been perfected by which the making of the solution has been greatly simplified.

Instillation of the fluid is made every two hours either with the fluid from the bottle (Fig. 164) or with a special glass syringe with a large rubber bulb, the object being to distribute it to every corner of the wound. In order to prevent any irritation the adjacent skin for a distance of 4 to 5 inches is covered with gauze impregnated with a mixture of vaselin 91 parts, paraffin 6



Fig. 162.—Baskets made by patient (Case III) after three weeks of instruction by vocational teacher.

parts, and resin 3 parts. For surface wounds the end of the tube is covered with a layer of turkish toweling. For joint wounds (Fig. 164) or infected compound fractures a number of instillation tubes are inserted so that the solution may be constantly in contact with every portion of the infected area. Time will not permit of a more detailed description of the Carrel method, but I have had ample opportunity to test its efficacy in a number of infected cases during the past year.

CASE IV.—Incised wound (made by a piece of glass) of left

hand with involvement of extensor tendons of index and middle fingers and compound dislocation of the metacarpophalangeal joint of the index-finger. Resection of wound edges, followed

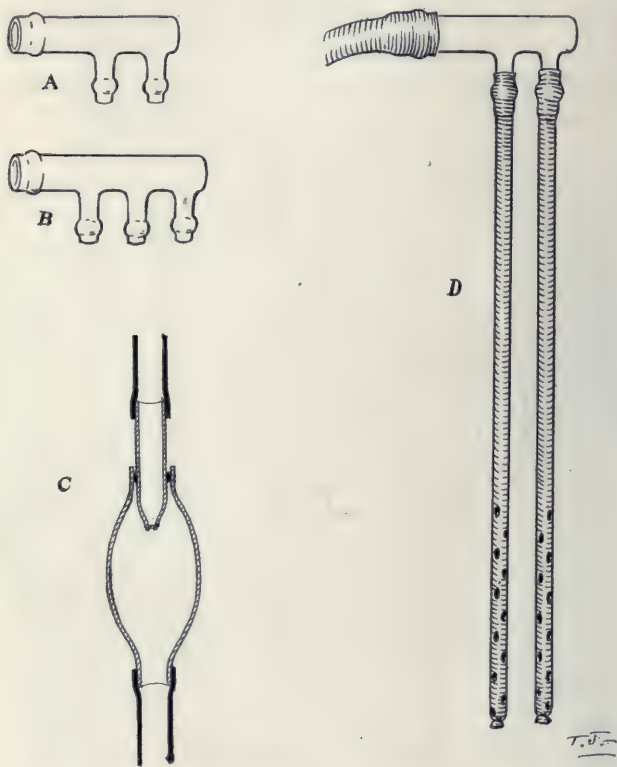


Fig. 163.—Carrel-Dakin tubing, etc., used in application of Carrel-Dakin method: *A*, Glass tube having two outlets; *B*, glass tube having three outlets; *C*, Murphy drip tube to note rate of flow of solution; *D*, two rubber tubes such as were used in cases spoken of in text. A silver wire is first placed in the lumen of each tube before tying distal end of tube with silk. The object of the silver wire is to keep the tubes rigid. Note multiple openings in tubes to permit easy escape of the solution.

by suture of tendons, joint capsule, and skin (primary suture). Healing by first intention. Excellent functional result.

At the beginning of this lecture I referred to the great advances in the treatment of wounds which had been accomplished

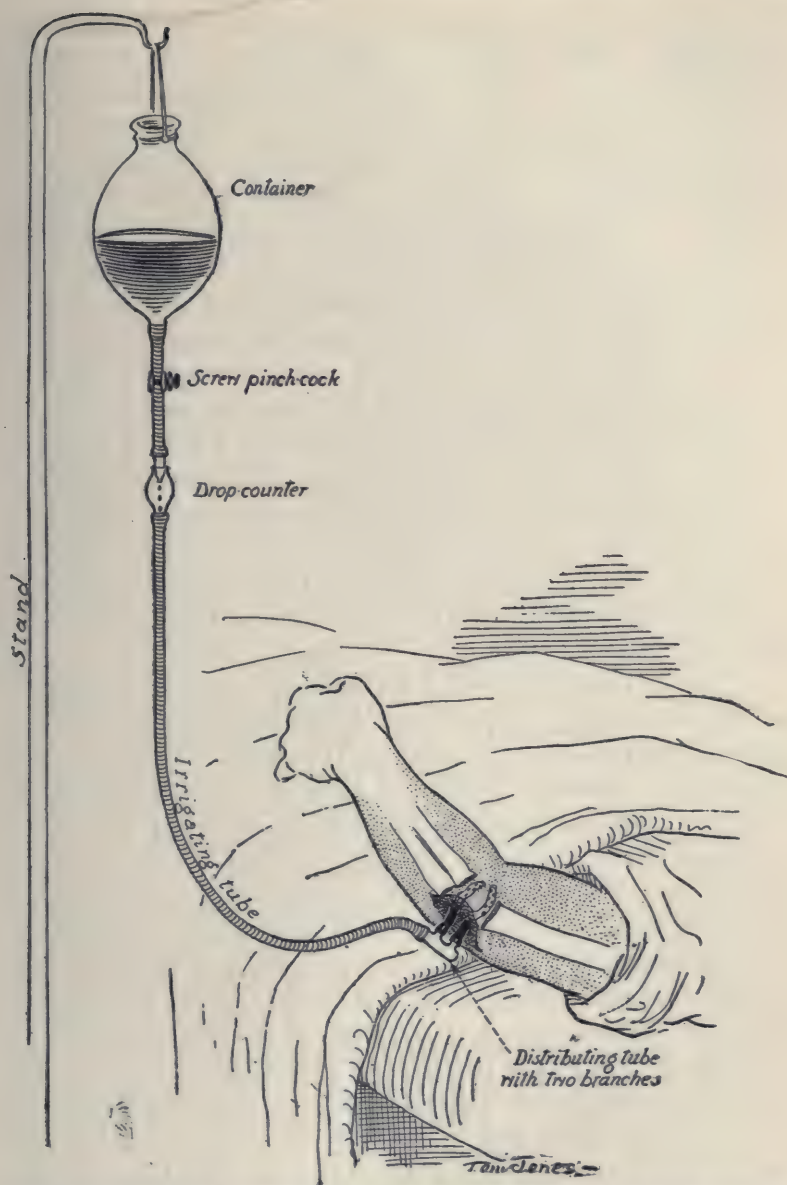


Fig. 164.—Method of using Carrel-Dakin solution in case of septic arthritis.  
(See also Fig. 163.)



during the present world war, especially since the introduction of primary, primary delayed, partial primary, and secondary suture technic. The aim of these newer methods is to utilize the natural defenses offered by the body fluids and tissues, *i. e.*, of the bactericidal action of the blood-serum and leukocytes in subduing infection. Infection, as I have previously stated, begins within six to eight hours after an injury, hence if cases are seen even within the first fifteen hours we can still do a primary suture or at least a partial one. If we are not sure of the wound being clean, it is best to wait and take daily cultures. If these show no growth, especially none of hemolytic streptococci, we can do delayed primary suture at the end of three to five days. In 890 cases recently reported by a French surgeon, Lemaitre, 80 per cent. healed by first intention when a complete primary suture was done within twelve hours after receipt of the injury, 6 per cent. had the same result by primary delayed and 9 per cent. by secondary suture. You can readily see what an incalculable saving this means in placing soldiers back on the firing line.

CASE V illustrates how I applied this method of primary suture to an injury in civil life. A boy aged fourteen entered the hospital two hours after being cut across the dorsum of the left hand by another boy with a piece of glass. Examination revealed a widely gaping incised wound extending from near the base of the dorsum of the thumb across the hand to the ring-finger. The capsule of the metacarpophalangeal joint of the index-finger had been extensively divided and the extensor tendons of this and the adjacent middle finger severed, so that a compound dislocation had taken place at the metacarpophalangeal joint. Under anesthesia we resected the torn skin, tendon, and capsule edges so as to eliminate all devitalized tissue. The wound in the capsule was sutured with fine chromic catgut after the dislocation had been reduced. The severed tendons were next united, and finally the freshened skin edges approximated without drainage of the wound. The result is, as you can observe, a perfect one. Healing has occurred by first intention, and now at the end of one month, thanks to early

mobilization, he can extend and flex the fingers within the normal range of motion. This case illustrates an application of one of the lessons of the present war, viz., primary suture of accidental wounds. In closing let me again direct your attention to the great value of the other two methods which today's cases have illustrated, viz., early mobilization of injured, especially of infected, joints and of the Carrel method.

Before closing the clinic I have asked Mrs. Sigsbee, of the Staff of teachers of the Favill School of Occupational Therapy, to give you a brief description of this new field of work.

#### THE PRINCIPLES UNDERLYING REHABILITATION AMONG THE HANDICAPPED<sup>1</sup>

One of the great benefits to humanity growing out of the calamity of war will be the reclaiming of our vast army of handicapped men. After previous wars the men who were left maimed were awarded medals of honor, given meager pensions, and left to face life as best they could. We have now come to realize that this does not discharge a nation's debt to its heroes.

England estimates 30,000 permanently disabled in each 1,000,000 after a year's service. With such stupendous numbers we can no longer fail to see the economic value of utilizing what in the past has been considered waste material. It is not conducive to a healthful state, mentally, morally, or physically, that our returned men should spend their remaining days in idleness. It is of mutual benefit to the individual and the state that his productive capacity be restored and that he return to civil life feeling once more that he is a necessary factor in the activity of the community.

There have been many attempts to establish schools to retrain civilian handicapped populations, but it remained for a trade school at Charleroi, Belgium, to bring this work to prominence and success. This school was destroyed by the German invasion, but its teachers and pupils were scattered into France, where their knowledge and experience proved of the greatest

<sup>1</sup> Remarks at close of Dr. Eisendrath's clinic on Joint Injuries by Mrs. Minnie S. Sigsbee.

value. The Ecole Joffre at Lyons became the model, and hundreds of centers are now established in all the warring nations. Germany had laid a most solid foundation for the restoration of her returned men. Within a week after hostilities began, her resources were organized for the rehabilitation of her crippled.

Rehabilitation and then re-education are worked out by very carefully developed steps, each department of the work being interrelated. The first responsibility rests upon the surgeon, who must work to conserve every possible unit of the man's capacity, the muscles and joints must be restored as far as possible, and the man brought to good general health. To replace amputations the most improved artificial limbs are substituted, and these the men must learn to use with facility. Interchangeable appliances are many in type, chosen according to the trade in which the man is to engage. It is primarily the lost function rather than the lost member which they will strive to replace.

The curative agency of work is an unquestioned fact, so that now we pass on to the second stage of rehabilitation. Functional restoration is carried on by medical electricity, massage, systematic physical exercise, and occupational therapy, which is begun before the patient has left his bed. Great importance is placed upon stimulating the man's interest at the earliest possible period, thus helping to tide him over a critical period of discouragement and prevent his lapsing into habits of idleness. Discipline is also much easier to maintain when the men are occupied with some wholesome task. This first occupational work should be diversional, curative, and if possible lead to the vocational training which now follows.

Previous to this point the man's former working experience has been recorded. Unless his injury prevents, he will return to his former occupation, or to some allied trade where his past knowledge may be conserved. If his handicap is such as to prevent this, or if he has not previously attained a permanent placement in the industrial world, he will be provided with a thorough training along another line. Trade schools, commercial



schools, and colleges will co-operate with the government in this work.

Very careful consideration is given to the selection of the work into which a man is to enter. He receives the advice of officers thoroughly conversant with industrial problems. Each man is studied individually, his disability, personal tastes, and temperament taken into consideration, and the employment possibilities of the trade taken into account—that they be growing industries, offering steady employment, and a good standard wage.

Some of the preferable trades are agriculture, motor mechanics, electrical trades, making of artificial limbs, printing, cobbling, tailoring, mechanical drawing, and oxyacetylene welding—many will elect to enter commercial courses. Placement of the men in jobs will be made by local agencies.

Now comes the test of the re-educating system. Only a most thorough training will stand the test, and the man's future welfare depends upon his being held in training until he is thoroughly skilled in his chosen line of work. He thus enters into active life with a confidence that universally spells success.

This will be the record of our returned heroes. They will have climbed the slow, hard road to recovery and have proved themselves as truly heroic in facing the problems of life as they did in facing death. This system will reach out and reclaim our handicapped civilian population. We will hope for the time when there will cease to be the cripple, when even the term will fall into disuse.



## CLINIC OF DR. BENJAMIN F. DAVIS

### PRESBYTERIAN HOSPITAL

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#### CYST OF THE URACHUS

*Summary:* Differential diagnosis of subumbilical space infection, umbilical concretion, persistent vitello-mesenteric duct and patent urachus; demonstration of urachal cyst at operation—discussion of the pathologic anatomy, symptomatology, diagnosis, and treatment of cysts of the urachus.

THIS patient is thirty-three years of age. He was perfectly well up to two years ago this coming August, at which time he was greatly annoyed by a very foul, whitish discharge from the umbilicus associated with a dull, continuous ache in the umbilical region. This was especially noticeable on very hot days, but did not leave him entirely until the onset of cooler weather in late September. He was then free from trouble until the next summer, when, during a very hot spell, the foul discharge and diffuse para-umbilical pain reappeared and annoyed him more or less continuously until cool weather again came to his relief. During this time frequent bathing, with particular attention to the cleaning of the umbilicus, failed to give any appreciable benefit. Yesterday he was again seized with pain about the umbilicus; the fetid umbilical discharge has been present on this occasion for a week or more. Unlike previous attacks, the pain has gradually increased in severity; the patient walked into the hospital about an hour ago doubled over with pain and begging for relief. He has not vomited. His bowels have moved regularly every day.

Examination reveals a strongly built man who appears to be suffering severely. He lies on his side with the knees drawn up and the body flexed. The eyes react to light and accommodation; the head, neck, mouth, and pharynx are normal; heart and lungs clear; the extremities negative; urine normal; leukocyte count



12,000. On inspection of the abdomen we notice two things: there is a slight discharge from the umbilicus and the region immediately surrounding the umbilicus is slightly raised, so that the umbilical orifice occupies the relative position of the crater of a volcano. There is no discoloration of the skin of the abdomen, not even an erythema about the umbilicus, and the abdominal muscles in general are moderately relaxed, in no way suggesting the rigidity so commonly noted in the presence of wide-spread, acute, intraperitoneal inflammation. We note also that the discharge which moistens the umbilicus has a peculiarly penetrating, disgustingly rancid odor. On palpation, the abdominal muscles in general are soft and there is no muscle spasm under the examining fingers. About the umbilicus, however, the abdominal wall is hard, and the patient complains of even the lightest touch. The umbilicus itself is unusually deep and funnel shaped; introducing a probe, we can pass it a distance of  $1\frac{1}{2}$  inches beyond the apparent bottom of the umbilicus in the direction of the symphysis pubis without, however, releasing any fluid or in any way relieving the pain. We are apparently, therefore, dealing with some process in a tissue which is associated with, but is not a part of, the umbilicus, unless the latter is in this instance extraordinarily deep and hour-glass in shape.

There are several possibilities to be considered here from the standpoint of diagnosis: First, infection of the subumbilical space. The subumbilical space is a definite, heart-shaped cavity about 8 cm. in length and 14 cm. in breadth lying below the umbilicus, which can be definitely outlined by injection methods. It is situated between the peritoneum and the sheaths of the muscles, and is often divided longitudinally into two cavities by the linea alba which forms a septum between the muscle sheath in front and the peritoneum behind. As stated by Cullen, there is no doubt that subumbilical abscesses can develop. The symptoms in the early stages strongly suggest peritonitis; later the general abdominal symptoms subside and a localized tumor can be detected just below the umbilicus. When opened, the abscess is found to lie between the muscle sheath and the

peritoneum. Usually the septum between the two sacs disappears, leaving only one abscess cavity.

Against the diagnosis of abscess of the subumbilical space in this case we have the absence of signs of general peritonitis at any time during the disease, the presence of a discharge from the umbilicus preceding and also coincident with the pain, and the history of previous attacks of this peculiar trouble apparently occurring at a time when the secretory activity of the skin was at its height, namely, in very hot weather.

A second possibility to be considered is that of umbilical concretion. Again quoting from Cullen, we may state that, as a rule, a patient with an umbilical concretion is unaware of any trouble until abdominal pain is felt. This is usually referred to the umbilical region, and may be increased on muscular exertion, on defecation, or on pressure on the abdomen. On visual examination sometimes nothing is detected. Later, induration is noted in the umbilical region, the umbilical opening becomes very small, and the surrounding tissue feels hard. The overlying skin may or may not be reddened. At this stage the patient may have excruciating abdominal pain, followed by the escape of a foreign body, together with some blood and pus. A speedy disappearance of the symptoms usually follows. The cause of these umbilical concretions with the associated inflammation is easy to explain. Owing to the lack of cleanliness or to an unusually deep umbilicus particles of hair or wool accumulate deep in the umbilical depression. These form a small ball, which, in turn, by its irritation causes exfoliation of the squamous epithelium. This adheres to the mass and gradually increases its size. Finally, as a result of constant irritation, there ensues a mild inflammation of the tissue surrounding the umbilicus which gradually narrows the umbilical opening until it becomes but little larger in diameter than a fistulous tract. Pus accumulates and dilates the umbilical depression, and an abscess cavity containing a concretion results.

In general, this description fits our case very well, but there are several points against accepting the diagnosis. First, the umbilical orifice here is not contracted; second, the umbilicus,

while deep and funnel shaped, can be explored to the level of the linea alba without exposing any pathology; third, a probe can be passed  $1\frac{1}{2}$  inches caudalward beyond the bottom of the umbilical depression and seemingly beneath the plane of the linea alba. We must, therefore, search further for a diagnosis, and at once there comes to mind the possibility of the persistence of some of the structures which find exit at the umbilicus in the embryo. We may be dealing with a persistent vitello-mesenteric duct or a remnant of the embryonic allantois. I believe that we can rule out the former on the following basis: If there were complete patency of the vitello-mesenteric duct, the discharge would have been present since infancy and would be fecal in character—not the highly rancid discharge of decomposing sebum; if only the distal portion of the duct had remained patent, the discharge would have been present since infancy, would be mucous in character, since such remnants are usually lined with intestinal epithelium (occasionally gastric epithelium), and would be fairly constant; moreover, a patent vitello-mesenteric duct would not lead an exploring probe caudalward, but more or less directly dorsalward. There is, therefore, but one thing left for consideration, namely, patency of the umbilical end of the urachus. This is very strongly suggested by the results of exploration with a probe, and if we imagine a sac at the upper end of the urachus communicating with the umbilicus through a small opening, we can readily picture the formation of a concretion in such a sac and the development of symptoms in every way similar to the umbilical concretions which we discussed a moment ago. We therefore accept the tentative diagnosis of cyst of the upper end of the urachus.

Now what shall our treatment be? We are told that, as a rule, dilatation of the umbilicus and removal of the stone is all that is required in the treatment of umbilical concretions. In this instance, however, the pathologic condition which we wish to remedy lies beneath the linea alba; we do not know its extent, and, while dilatation might give temporary relief, contraction of the ring with recurrence of symptoms at a later date is almost certain. We will, therefore, operate with the intention



of removing completely any pathologic tissue. Under novocain anesthesia I make a midline incision about 4 inches in length which splits at its center to encircle the umbilicus. The umbilicus is skeletonized without great difficulty except when

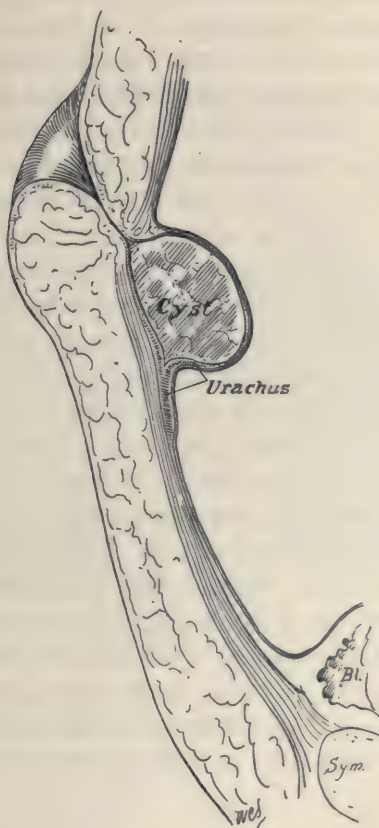


Fig. 165.—Longitudinal section of midline of anterior abdominal wall illustrating the relation of the cyst to the umbilicus, the urachus, the linea alba, and the peritoneum.

traction is made on it; at this the patient complains of intense pain of the old type. We have now exposed the linea albæ and find, as we had expected, that the umbilicus is continuous through it with some bulbous structure. Manipulation of the umbilicus is so painful, however, and the pain is apparently so beyond con-

trol of a local anesthetic that we give this patient a few whiffs of ether for the completion of the operation. With the patient lightly anesthetized, I incise the linea alba, beginning my incision at the point of emergence of the umbilicus and continuing it downward a couple of inches. Immediately there comes into view this globular structure, about as large as the terminal phalanx of my thumb, continuous with the umbilicus above and tapering off caudalward into this white, round cord about 3 or 4 mm. in diameter, which is undoubtedly the obliterated urachus. This structure lies between the peritoneum and the fascia of the anterior abdominal wall and is very easily lifted from its bed (Fig. 165). I cut the urachus about 1 inch below its enlarged upper end; its cavity is entirely obliterated at this level. You will observe that all this dissection has been extraperitoneal. I close my incision in the usual manner with silkworm-gut tension sutures, catgut for fascia and silk for skin, leaving a strip of guttapercha tissue in the wound for drainage.

*Note.*—A rather severe infection with an odor resembling that of the discharge from the umbilicus before operation developed in the wound, but rapidly cleared up, and the patient left the hospital two weeks later with the wound entirely healed.

As I incise this mass which I have removed, a few drops of pus ooze out, and then I free a friable concretion which readily crumbles under light pressure by the fingers. We find that the epithelium lining the umbilical depression terminates abruptly at about the level of the constriction produced by the linea alba and the interior of the sac is lined by granulation tissue (Fig. 166).

*Note.*—This was later confirmed by microscopic examination.

It will not be amiss here to say a few words on the subject of urachal cysts. Minute cysts appear to be fairly common. Thus Uritz (*Virchow's Archiv.*, 1883, xcii, 387) examined 74 bodies in a search for such lesions, and found them in 24 out of the 74. Clinically, they are much less common. Weiser (*Annals of Surgery*, 1906, xlv, 529) analyzed 89 cases which he culled from the literature, including 19 so-called allantoic cysts,

which by some are thought to have been examples of localized pelvic tuberculous peritonitis. In the majority of cases the patients were adults, and there were three times as many females affected as males. According to Weiser, urachal cysts are found in the midline between the umbilicus and pubes; they may be soft and fluctuating, resembling a distended urinary bladder, or firm and apparently solid. There may be pain in the lower part of the abdomen—this is usually from an associated local

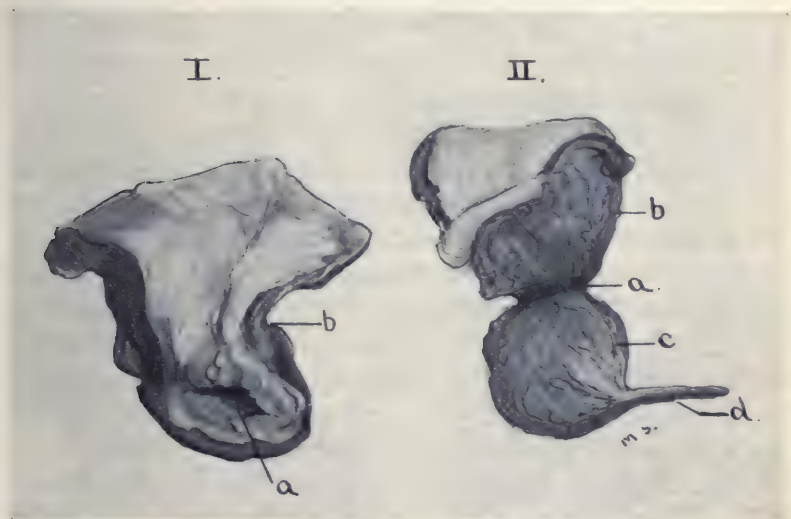


Fig. 166.—Cyst of urachus. I. View from cephalic side; umbilical pouch slit open: *a*, Communication with exterior through depths of umbilicus; *b*, zone of constriction by linea alba. II. Lateral view: *a*, Constriction at zone surrounded by sense fascia of linea alba; *b*, umbilicus external to linea alba; *c*, subaponeurotic pouch and cyst; *d*, continuation of urachus; not patent.

peritonitis, as in many instances the cysts are unnoticed until they, in some way, become infected. They may imitate encysted peritonitis, especially of tuberculous origin, and ovarian cystadenomas. In general, any or all of the following symptoms may be found (Uritz):

1. Mass between umbilicus and symphysis pubis.
2. Feeling of illness.
3. Loss of weight.



4. Abdominal pain.
5. Fever—often.
6. Gastro-intestinal disturbances.
7. Emaciation.
8. In 15 per cent. of cases a discharging sinus at the umbilicus.

To this list we may add the following hints (Dössebbber, *Beitr. z. Klin. Chir.*, 1893, x, p. 102): Urachal cysts do not always appear in the median line; they may be displaced to one side or the other. They may reach great size and be confused with other tumors, particularly ovarian cysts. The cyst wall is composed of dense connective tissue in which smooth muscle-fibers may be found; the epithelium lining the cyst is usually of the transitional type; the cyst contents usually consist of a thin fluid, but are not urinary. Hemorrhage may occur in such cysts and produce symptoms similar to those of torsion of the pedicle of an ovarian tumor.

We may summarize the diagnosis as follows (Cullen, *The Umbilicus and Its Disease*, 1916): Urachal cysts have been diagnosed as (1) distended bladder, (2) ascites, (3) appendicitis with abscess formation, (4) ovarian cyst with or without twisting of the pedicle, (5) localized peritonitis with serous exudate under the anterior abdominal wall, (6) tuberculous peritonitis.

The distended bladder is readily emptied, and the ascites relieved by paracentesis. With the patient asleep it is relatively easy to outline the cyst and to differentiate it by the absence of the induration usually associated with an appendix abscess. Furthermore, with the abscess there is more likely to be a history of an elevation of temperature and of a definite leukocytosis. An ovarian cyst, whether mobile or twisted, lies much further back in the abdomen, and can be separated from the anterior abdominal wall, particularly when the patient is under narcosis. The differentiation from a localized peritonitis or from a tuberculous peritonitis is not so easy, particularly when the patient has become emaciated. Even in these cases, however, when the patient is asleep, the sharp outlines of the urachal cyst are readily distinguishable from the rather diffuse cystic accumulation occurring with a peritonitis. Again, in the case of a urachal

cyst, moving it from side to side is likely to produce traction on the umbilicus. With an aspiration needle one can readily remove some of the cyst fluid and thus usually settle the diagnosis.

The treatment of urachal cysts is by excision—sometimes quite a simple procedure, as the cysts are always extraperitoneal. Occasionally, in the case of a large cyst or one in which there has been inflammation, excision may be rendered difficult and dangerous by the involvement of the peritoneum and by adhesions through it to the abdominal viscera.

In conclusion, permit me to say a word regarding the incision which I have used here. It was, as you observed, longitudinal. As a general proposition, transverse incisions are best in operations about the umbilicus which are carried through the aponeurosis; it has been clearly demonstrated at the Mayo Clinic that transverse incisions in this location permit much the firmer and safer closure. The longitudinal incision seemed more desirable here, because I did not know how far toward the bladder the dissection might have to be carried, and it seemed possible that a transverse incision might not allow sufficient exposure.





# CLINIC OF DR. GUSTAV KOLISCHER AND DR. J. S. EISENSTAEDT

MICHAEL REESE HOSPITAL

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## TUMORS OF THE URINARY BLADDER

*Summary:* Presentation of 3 patients illustrating the characteristic history, signs and symptoms, and endovesical appearances of benign and malignant bladder papillomas, and carcinoma of the prostate ulcerating into the bladder; treatment—superiority of fulguration, radiotherapy, and diathermy over cutting operation; value of cystostomy and nephrostomy; prognosis.

THIS patient reports that about two years ago, feeling an unusually imperative desire for urinating, he picked up his night vessel and to his surprise he noticed that the urine voided was stained a dark red. After the full urinary stream stopped and the usual contractions of the perineal musculature were started, in order to express the last drops out of the bulbous, clear liquid blood dribbled out of the penis. The patient had a good night's rest and the urine passed after awakening was clear in a general way, just showing a few fine dark filaments, evidently blood coagula. After twenty-four hours even those disappeared, and the urine remained clear for quite a long time. No unusual subjective symptoms molested the patient.

Hemorrhages as above described have become more frequent during the last three months, and the patient, alarmed by this experience, came to seek professional advice, although no perceptible changes in his general well feeling were noticed by him.

The urine passed in our presence is clear and emanates the normal aromatic odor.

Its reaction is acid and a centrifugalized specimen shows under the microscope nothing but some bladder epithelia and a few red blood-cells. The patient gives a negative history as to

venereal infection and there are no evidences of such to be found at our present examination. In order to determine the origin of the hemorrhages reported we will proceed to the ocular inspection of the bladder.

The catheter, introduced for the purpose of emptying the bladder first and then to distend it with sterile water for the purpose of cystoscopy, passes smoothly through the urethra, the same being true of the following introduction of the cystoscope. The inspection of the interior of the bladder reveals normal conditions in the vertex and in the fundus, the mucosa shows the proper yellowish gloss, the ramifications of the superficial blood-vessels are to be seen very clearly. The same is observed in the base of the bladder, but located about 1 cm. centrally from the right ureteral opening there rises a flat stalk of about 5 mm. width and of a thickness somewhat under this measurement. This pedicle emerges straight into the cavity of the viscus, has a glossy surface, and is transparent; the blood-vessels permeating the bladder fundus are visible right through it. Blood-vessels embedded in this stalk and running parallel to its longitudinal axis are distinctly viewed and recognized as arteries and veins by their respective red and blue coloring. About 3 cm. above its basic insertion this stalk divides itself up into numerous ramifications, showing the same characteristics as to gloss, transparency, and identification of blood-vessels as the stalk itself. The free ends of these arboreous ramifications are thinned out to fimbriated tops, but even the edges of those do not show any signs of breaking down, and the continuance of the contour is maintained. Movements of the cystoscope or the respiratory motions producing "undulations in the fluid distending the bladder make the stalk and the divided leaves" crowning it sway to and fro like the branches of a water plant. Here you see a classic example of a papilloma of the bladder without any manifestations of malignancy—no infiltration or hemorrhages around the base of the pedicle; the pedicle narrower than the crown of the tumor; the epithelial covering of the whole growth intact; no signs of breaking down. It is easily understood how copious hemorrhages may occur due to a rupture of these rather large blood-vessels

running close to the surface through the filigree work of the papillomata, while the presence of a few red cells found in the urine during the free intervals may be explained by diapedesis through the thin walls of these superficially located blood-vessels.

The thinness and pliability of the growth, the smoothness of its surfaces, and the lack of infiltration at its base account for the scarcity of subjective symptoms and for the tolerance of the bladder toward instrumentation and distention. Inasmuch as two other bladder cases also suspicious of tumors are to be demonstrated, the discussion of the therapy will be reserved for a cumulative presentation.

The next case concerns a man of forty-five years who also recounts that for the last two years he has been subject to recurrent attacks of hematuria. While in the first year the subjective symptoms were not very bothersome, during the last twelve months or so the hematuric attacks have not only become more frequent, but the bladder and its appendages have become the source of practically permanent annoyance. The patient is always conscious of his bladder, the vesical region is the seat of a sensation of heaviness and unusual warmth, occasionally lancinating pains shoot through it and irradiate into the rectum and perineum, each urination is more or less painful, inducing the patient to all kinds of manipulations in an attempt to find relief, squirming with the pelvis, milking of the penis, and so on. Occasionally it is very hard to start the urinary stream, until finally, calling into activity all accessory muscles, a coagulum is forced out of the urethra, which is followed by urination, the last act of which again is marked by pain and spasmodic contractions of the perineal musculature. The urine is cloudy and carries lots of darkly stained coagula; it still is faintly acid, but its odor is slightly foul. Chemical and microscopic examination reveals the presence of traces of albumen, numerous red blood-cells, fresh and in all stages of decay, lots of pus cells, and nondescript débris.

The introduction of the catheter for the purpose of flushing and distending the bladder is perceived by the patient as very painful when its tip passes the posterior urethra. In order to



spare the patient suffering and ensure tolerance for the distention of the bladder we inject into it about 10 c.c. of a 4 per cent. antipyrin solution, which inside of ten to fifteen minutes produces analgesia sufficient for the execution of a cystoscopic examination. The use of cocain or similar alkaloids is better avoided in cases in which we have to expect to encounter raw surfaces, which may lead to rapid absorption and the dangers of cocain-poisoning.

The ocular inspection of the bladder shows the top and fundus of the bladder intact, only a pronounced injection of the blood-vessels is to be observed. When the beak of the cystoscope is turned downward it is discovered that the trigonal mucosa is slightly edematous and permeated by dark red patches of irregular shape, submucous hemorrhages, some of them being of older date are almost black. Into the lower left quadrant of the bladder is seen to protrude a globe-shaped body, the top of which carries a depression, the edges of which are irregularly serrated, flakes of a dirty white color attached to them waver in the filling fluid; the bottom of this loss of substance is covered with phosphates glistening in the light. This globe is carried by a pedicle of the diameter of a lead pencil, the basis of which is implanted in the center of the trigonum. Around this base the mucosa is elevated in thick folds, has lost its sheen, and no blood-vessels are to be seen, a big bright red blotch surrounds it, marking a recent submucous hemorrhage. The edema around the base of the pedicle and the hemorrhagic patches in the mucosa point to an invasion of the adjacent tissues by the tumor and subsequent interference with the circulation. The breaking down of the mass on its top is due to the retrogressive changes common in malignant tumors. Considering that the pedicle is still markedly differentiated from the top and of a smaller diameter, the supposition is justified that this tumor was originally a pedunculated papilloma that, as happens so frequently, turned into a pronounced malignant growth.

The bulkiness of the tumor, the interference with the circulation, and its raw surface on top explain very readily the accentuation of the subjective symptoms during the latter period of its existence, while the exaggerated sensitiveness of the pos-

terior urethra must be ascribed to the congestion around and near the outlet of the bladder. The frequency and abundance of the hemorrhages are due to the breaking down of the summit of the growth and the subsequent erosion of the blood-vessels.

The albumen in the urine is due to the presence of blood and pus produced by the decaying of the tumor.

The next case to be examined and demonstrated concerns a man of about fifty-six years of age. Without any cause known to the patient, about a year ago, quite suddenly, rather severe symptoms of dysuria set in. At first he noticed that the urinary calls became very frequent, especially so during the night. At each act only small quantities of urine were voided, pretty soon micturition became painful, the pain noticed mainly in the vesical region, then the pain became constant, only slightly relieved by urination. Later on repeated hematuria was observed; in the last few months the urine assumed a fetid odor and carried solid pieces; in the last week the patient has had to urinate every few minutes, expressing, under agonizing pains, a few teaspoonfuls of turbid or bloody urine, each micturition followed by a regular delirium of the bladder, the spasmodic contractions of which cause exquisite suffering. In order to make a satisfactory examination of the bladder in such a case the sensibility of the patient has to be obtunded by morphin. This is preferable to general anesthesia, because it requires a very deep anesthesia to make the bladder tolerant—the bladder is known as the *ultimum moriens*—and the influence of the anesthetic on the kidneys has to be feared in a case of this kind.

The best way to administer the morphin is by inserting into the rectum a suppository carrying  $\frac{1}{4}$  grain of the drug. Inside of ten minutes the patient is sufficiently under the influence to permit flushing of the bladder and distention of the viscus by the minimum of fluid necessary for successful cystoscopy.

You will notice that it takes quite a number of flushings to make the fluid return clean enough to permit of cystoscopy. The hand governing the piston of the syringe feels a rigid resistance when the injection reaches about 75 c.c., indicating that

this quantity will be the limit of distention tolerated by the bladder for the purpose of inspection. The cystoscopic view presents in the vertex only normal appearing mucosa, the rest of the inner vesical surface is of a dark red hue without any visible blood-vessels. The right lower quadrant of the bladder gives a distinct impression of rigidity, the right ureteral opening is gaping, its edges are sclerotic, and remain immovable even during the act of throwing the urinary jet into the bladder; between the ureteral mouth and the internal urethral orifice there appears a loss of substance sunk down into the bladder wall, its margins are serrated, partially undermined, its center is covered by irregular discolored granulations. This defect is surrounded by a few warty growths of an angry red, dark blotches around them marking submucous hemorrhages. This picture characterizes an infiltrating carcinoma of the bladder wall without any distinct tumefaction protruding into the viscus. This infiltration explains the rigid resistance of the bladder offered to attempts at distention.

The last case to be presented concerns a man who reports symptoms that, as a rule, are ascribed to prostatic hypertrophy. He has been suffering for quite a long time from increased frequency of urination; his nightly rest is disturbed by repeated urinary calls; the act of micturition is not followed by the normal satisfaction; each movement of the bowels is accompanied and followed by disagreeable sensations in the rectum; he is permanently bothered by the feeling of carrying a foreign body in the lowest segment of the large bowel. Lately the region of the prostate became the seat of lancinating pains, and he noticed repeatedly that the urine was stained with blood to a varying degree. Repeated catheterization and flushing of the bladder executed by his family physician failed to relieve his suffering, and at certain instances the instrumentation was followed by rather severe hematuria. Rectal examination reveals the prostate to be considerably enlarged; embedded in the prostatic tumor there are to be felt several hard nodules that are extremely sensitive to touch; catheterization immediately following spontaneous urination proves the presence of a con-



siderable amount of residual urine. The urine is slightly turbid, faintly acid, and contains a few rusty looking coagula. An unusual length of the catheter has to be introduced before the urinary flow is started, proving an elongation of the posterior urethra, pointing to an enlargement of the prostate gland. The introduction of the cystoscope following the preliminary flushing and filling of the bladder encounters some difficulty in the posterior urethra, proving an obstacle in this region. The general inspection of the bladder shows pronounced trabeculization of the bladder wall, indicating a labor hypertrophy of the muscular coat due to the necessity of overcoming an obstruction of the urinary canal. The normally concave contour of the internal urethral opening is changed to a V-shaped figure in the upper circumference and to a convexity in the lower half, due to the bulging of the enlarged prostate into the viscus. The prostatic protrusion of the right side is covered by edematous mucosa that is spotted by dark patches, indicating submucous hemorrhages. On top of the prostatic lump there is to be seen a crater, the edges of which are ragged, its center is covered by irregular discolored granulations, a few old coagula are attached to them, and are floating with their free ends in the filling fluid.

Diagnosis: Carcinoma of the prostate growing into the bladder and carrying on top a cancerous exulceration facing the interior of the bladder.

The therapeutic aspects of tumors of the bladder depend on the character of the neoplasm discovered. Papillomata of the kind demonstrated in the first case offer a favorable problem as to removal and remote results. Cutting operations in such instances are abandoned by all operators who are conversant with endovesical manipulations, and they employ instead the destruction of these flimsy growths by the application of a spark produced by high-frequency currents, the so-called fulguration. The reasons for this are weighty. Fulguration is executed through an operative or ureteral cystoscope, and therefore avoids opening of abdomen and bladder as preliminary for the removal of the growth; there is no necessity for having the

patient laid up in bed and the natural functions of the urinary organs are in no way impaired. Fulguration in most instances may be performed without any anesthesia; in very sensitive individuals morphin or novocain anesthesia suffices.

Finally, the remote results of fulguration far excel the results furnished by cystotomy and excision of the papilloma. It is nothing unusual to see a cutting operation followed by multiple relapses all over the vesical mucosa, contrary to the experience in fulguration. The latter procedure may be repeated without any trouble any time that it is deemed necessary, and multiple tumors are just as easily handled by this method as single ones.

The operative therapy of malignant bladder tumors forms one of the tristest chapters of the, at best, rather unsatisfactory surgery of malignant tumors of the viscera. A great many cases coming under observation are already inoperable when they are diagnosed; operations, even so-called radical ones, are almost invariably followed by early and extensive recurrences, not to mention that the primary mortality is very high. It therefore is not to be wondered at that a great many operators, and especially those with a large special experience, refrain nowadays entirely from operating for malignant tumors of the urinary bladder with a view of cure, and restrict themselves only to interferences of a minor character that tend to furnish some relief, such as cystostomy or nephrostomy—in the first instance to drain the bladder and to relieve it from painful distention by accumulation of urine; while, secondly the establishment of bilateral renal fistulas deviates the urine entirely from the bladder. This practice is supported by the fact that, especially in malignant tumors of the bladder, radiotherapy shows a favorable percentage of clinical cures and palliative achievements.

Radiotherapy does not produce any primary mortality, its administration does not lay the patient up, and even if not successful it does not lead to the unspeakable suffering forced on the patient by recurrences after cutting operations.

The therapeutic rays are administered by placing the selected radio-active substance directly into the bladder, the carrier

being a urethral steel sound with a removable gold tip, which functions as a filter. In prostatic tumors raying is also done from the rectum, the container and filter placed in the lowest part of the rectum opposite to the prostate.

Fulguration in malignant vesical tumors is not only of very little therapeutic value but also liable to start an explosive luxuriation of the growth into the adjacent structures.

It remains to discuss the most efficient palliative intervention resorted to, if the condition of the patient calls for immediate relief.

In case the patient should become highly uroseptic, or if the bladder becomes so intolerant that the patient is in permanent agony, or if the vesical hemorrhage becomes unmanageable, the bladder has to be opened by suprapubic section. This drainage of the bladder will help to combat the urosepsis, and at the same time makes the tumor accessible to topical treatment.

The most efficient way of dealing with the exposed growth is the coagulation of it by means of diathermy. This procedure consists in necrosing the tumor tissue by running through it high-frequency currents of low voltage and high amperage. Through the resistance of the tissue to the current so much heat is produced in the structures that thorough coagulation is achieved.

For this purpose the tumor is caught between two rather larger electrodes and the current sent through it. By placing the electrodes opposite to each other at various diameters of the growth it is thoroughly coagulated. Transforming, in this way, the tumor into a leathery eschar immediately does away with the hemorrhage and pain, while the sealing of the lymphatics and blood-vessels in the neighborhood of the tumor prevents dissemination of tumor cells into the adjacent structures—a dangerous incident so often accompanying cutting operations for tumors. This “cooking” of the malignant growth is followed by systematic applications of a radio-active substance. In about ten days the eschar sloughs away and leaves a clean granulating surface. In a good many cases the operator will



experience the satisfaction that the bladder closes up, and that for a long time the patient is kept in apparently good health and free from suffering until complications or the formation of metastases in vital organs cause death.

The primary mortality of this procedure is not any greater than the mortality connected with a simple cystotomy in individuals of impaired health.

## CLINIC OF DR. WILLIAM EDWARD O'NEIL

### EVANSTON HOSPITAL

#### PERSISTENT PATENT OMPHALOMESENTERIC DUCT

*Summary:* Congenital abnormalities of the umbilicus—their embryologic significance; symptomatology; technic of x-ray diagnosis of persistent patent omphalomesenteric duct; complete surgical removal the only logical treatment.

**History.**—The patient, a healthy male child eight weeks old, whose father and mother are living and well, was born after a full-term pregnancy and normal labor. At birth it was noted that the frenum of the tongue extended to the extreme tip of the tongue, binding it firmly to the floor of the mouth, so that motion was almost impossible. It was also noted that there was sufficient absence of prepuce to constitute a circumcision. A complete supernumerary little finger was present on the left hand. Nothing otherwise abnormal was observed until after the separation of the cord, which occurred on the tenth day, leaving a dark strawberry red, velvety looking, pedunculated, rounded surface about the size of a cherry, with a slight dimple in the center, through which it was possible to pass a fine probe for a short distance (Fig. 167). Following the separation of the cord there was intermittent profuse bleeding from the remaining stump, but this lasted only a few days, and was succeeded by a slight capillary oozing which continued up to the time of operation. There was no discharge of mucus, urine, gas, or feces from the umbilical region, and there were neither signs nor symptoms of obstruction of the gastro-intestinal tract. There was no evidence of hemorrhagic disease of the newborn or any evidence of syphilis. The child was breast fed and had gained in weight progressively and continuously, and was free from distress except for occasional attacks of severe colic, which seemed to

bear no relation to feedings, and which were not relieved by enemata, but which did disappear after operation.

**Comments and Operation.**—Anatomic anomalies in the region of the umbilicus are not uncommon, as may be seen from a perusal of Cullen's excellent work, "The Umbilicus and Its Diseases," and though observed most frequently during infancy and early childhood, they are also not infrequently seen in adult life, when the symptoms of a mechanical or obstructive nature, which they frequently cause, demand investigation.

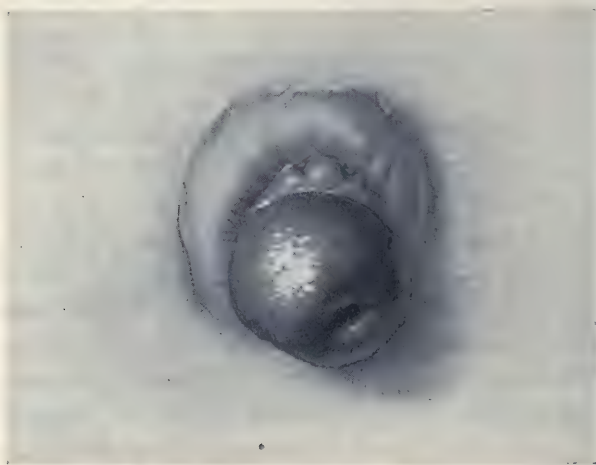


Fig. 167.—Cherry-like mass at umbilicus. Note dimple through which probe may be passed or bismuth suspension injected into bowel.

To understand the causes and possibilities of the various abnormalities in the region of the umbilicus in both the newborn and the old, we should briefly recall the following bit of embryology: the allantois, which is one of the earliest structures to be differentiated in the embryo, develops from the yolk-sac. It is recognized as a recess of the yolk-sac and extends into the body stalk of the embryo. After a time the allantois is curved downward and forward and terminates in the cloaca at the lower end of the hind gut, and a little later in embryonic life is separated from the cloaca by the urorectal septum. The bladder develops from the lower part of the allantois thus separated



from the cloaca, while the upper tubular part is continued to the umbilicus and passes into the cord, the remaining intra-abdominal part eventually becoming the urachus. This upper part of the allantois normally obliterates before the termination of intra-uterine life, and is represented by a fibrous cord which is known as the urachus, but it may persist as an embryonic remnant, open at both ends, producing urachal fistula, or closed at both ends with patent middle, producing urachal cysts. The early primitive gut tube was connected to the umbilical vesicle by the vitelline or omphalomesenteric duct, which develops from the yolk-sac by intrusion into the embryo. During the sixth week of intra-uterine life the vitelline vesicle begins to lose its usefulness. The duct is attached to the ileum near the ileocecal valve, and at this time may do one of the following things: (1) it may become obliterated, which normally occurs; (2) may remain a culdesac; (3) may remain patent, connecting the interior of the ileum with the external world via the umbilical aperture, which may give rise to congenital fecal fistula. The duct may also close at the intestinal and umbilical ends, remaining patent in the middle, producing an omphalomesenteric cyst. Another possibility is the formation of a fibrous cord extending from ileum to umbilicus, being attached to both.

Remnants of both the allantois and omphalomesenteric duct are found at almost all ages, their recognition being due to the presence of urinary or fecal fistula or symptoms of obstruction of the gastro-intestinal or urinary tracts, and their true nature often being diagnosed only at the time of operation or at autopsy.

Of the various abnormalities that may obtain in this region, the following classification of the more frequent and important is taken from Cullen's excellent work on this subject:

A. Remnants of omphalomesenteric duct:

1. Umbilical polyps and granulomata.
2. Gastric mucosa at the umbilicus.
3. Patent outer portion of omphalomesenteric duct.
4. Meckel's diverticulum.
5. Intestinal cysts.
6. Patent omphalomesenteric duct.

7. Patent omphalomesenteric duct opening at side of cord at birth.
8. Persistent vitelline vessels.
9. Carcinoma.
- B. Remnants of urachus:
  1. Patent or open with vesico-umbilical fistula.
  2. Closed, forming—
    - (a) Small urachal cysts.
    - (b) Large urachal cysts which may be—
      - (1) Non-infected.
      - (2) Infected.
  3. Urachal cavities located between umbilicus and symphysis.

Remnants of the vitelline duct usually partake of the histologic structure of the intestine.

Umbilical polyps and granulomata are usually due to incomplete healing of stump left after separation of the cord. They may, however, be the external isolated end of the vitelline duct. They vary in size from that of a pea to that of a hazel nut or larger, and may or may not be pedunculated. They are soft and red, and have often been observed to disappear after the local use of caustics or astringents.

The so-called gastric mucosa at the umbilicus is a polyp-like growth presenting an appearance not unlike the gastric mucosa, and in isolated areas shows histologic elements similar to glandular structures in the pyloric end of the stomach. At times these growths present both the glandular structures identical with the glands of the pyloric end of the stomach and the glandular structure of the intestine. There are no recorded cases, however, of operation where a connection between these areas and the stomach was shown to exist.

When a patent outer portion of the omphalomesenteric duct is present there is usually found at the umbilicus a nodular or granulating surface with a depression and canal that permits the passing of a probe a variable distance into the abdominal cavity. In size these growth-like projections vary from that of a pea to that of a chestnut or larger. When operated upon

there is found to be a patent duct at the umbilical end joined by a fibrous cord to the intestine, while microscopic examination shows the mucous lining to resemble that of the intestine.

Meckel's diverticulum is perhaps the most commonly found remnant of the vitelline duct and is the persistent intraperitoneal part of the duct, usually attached to the convex surface of the ileum a short distance from the ileocecal valve. It is free and ends blindly, though rarely may be attached to the mesenteric border of the intestine and may have a mesentery of its own. Meckel's diverticulum is a potential cause of intestinal obstruction, as the tip may become attached to a distant point or organ and thus form a constricting band. There is, in Cullen's review, a record of a unique case of strangulation of the bowel due to small intestine herniating through a hole in the mesentery of a diverticulum as shown at autopsy. Another very rare case, mentioned also by Cullen, shows the serious and fatal possibilities of Meckel's diverticulum in which intussusception of diverticulum took place into the intestine, causing obstruction followed by gangrene, perforation, and death. These cases are unusually difficult to diagnose, as there is no external local evidence that gives a suggestion of the cause of the obstructive symptoms, laparotomy affording the only means of ascertaining the true nature of the obstruction.

Intestinal cysts form an interesting group of vitelline duct remains, and may be intraperitoneal, extraperitoneal, or intramural. They sometimes develop from Meckel's diverticulum by a process of slow rotation without strangulation or gangrene taking place, and they not infrequently arise from the central portion of a persisting vitelline duct by closure of the intestinal and umbilical ends. Those arising from Meckel's diverticulum may lie free in the peritoneal cavity, as they usually do, but may also be found between the layers of the mesentery, as Meckel's diverticulum may rarely be attached to the mesenteric border of intestine. These cysts lying free in the abdomen are in the same danger of rotation on their pedicles with subsequent strangulation and gangrene as are other cysts, such as ovarian or pedunculated tumors. A rare possibility is the formation



of cysts within the abdominal wall. The size is not constant, and there are a few reported cases where such proportions were attained during intra-uterine life as to make delivery impossible. Accurate diagnosis is possible only at time of operation, and oftentimes is not made except at postmortem examination. All cysts of this embryonic type usually give rise to symptoms early, but manifestations of their presence may be delayed until adult life, as is shown in one case where the patient (a woman) attained the age of thirty-two before symptoms arose demanding operation, from which she recovered.

A patent omphalomesenteric duct also has a polyp-like external appearance, which is characterized by redness, a tendency to bleeding and capillary oozing, and is often attended by the discharge of gas and feces at the umbilicus. Patients may attain adult life before the condition is recognized and symptoms arise calling for relief. The same dangers and difficulties may arise with this as with Meckel's diverticulum, such as the formation of a constricting band with the production of obstructive symptoms. By obliteration of the proximal and distal ends of the duct with the central portion remaining patent, cysts may form, being attached to the intestine and umbilical region by fibrous cords. Prolapse of the bowel may take place through the umbilical opening and the patency of the canal can often be easily demonstrated by the passage of a probe into the intestinal canal. A patent omphalomesenteric duct may open at the side of the cord and so manifest itself at birth, as is reported in several cases with autopsy findings, and differs from the ordinary persistent patent vitelline duct in that the escape of intestinal contents takes place before the cord has separated. There is usually a tumor-like projection at the side of the cord at birth, and within a few days there is a discharge of intestinal contents from this point.

Carcinoma of the umbilical region may be primary, as has been shown in many reported cases, but is almost entirely a condition of adult life, as all the reported cases were in late adult life, though two or three were reported as having been seen in young adults.

Prolapse of bowel through a patent duct, rotation of diverticulum and rotation of cysts with strangulation and gangrene, and intestinal obstruction by bands and adhesions are among the more common causes that give rise to serious symptoms from the presence of these embryologic structures or remains. Among other sources of mechanical danger are the persistent omphalomesenteric vessels, which may remain after obliteration of the duct; or the remains of these vessels may be represented by fibrous cords, which may easily cause constriction and strangulation of the intestines or omentum.

Remnants of the urachus usually partake of the histologic structure of the urinary bladder and are extraperitoneal. The open or patent remnants usually manifest themselves after the separation of the cord, and the most common symptom is the discharge of urine at the umbilicus. The urine may come away in a continuous stream or slowly and intermittently, which is by far the more frequent manner of appearing, though if associated with obstruction of the urethra the flow is more or less constant, excoriation of the surrounding skin ensues, with the production of eczema from the irritating discharges, which may also occur with a patent omphalomesenteric duct. The urachal canal may be straight or tortuous, and varies in caliber. Closed remnants of the urachus usually manifest no external evidence early. The persistent urachus may be closed at the umbilical end and communicate with the bladder by the other end, and in this instance go unobserved. Both ends of the urachus may be closed, the middle portion remaining patent, producing a urachal cyst. A urachal pouch may form from the closure of the bladder end of canal, while the umbilical end remains open, with intermittent discharge of contents.

The cysts resulting from a persistent urachus may be small, which are often discovered only accidentally, or may be large, which, because of their size or prominence, require treatment, and this is particularly true when the element of infection is added. Like remains of the vitelline duct, these cystic formations are revealed very often only at the time of operation.

**Diagnosis.**—The chief symptoms present in this patient are

hemorrhage from the stump remaining after separation of the cord, and the strawberry redness of the small pedunculated mass. Absence of the discharge of contents of either bladder or intestine made a positive early diagnosis more difficult than if these valuable symptoms were present. However, abnormalities in this region are most frequently due to the persistence in whole or part of embryologic structures; and it was assumed that either the urachus or vitelline duct was the cause of the condition present. Frequently a probe has been used as a means of diagnosis with varying degrees of success in revealing the patency and direction of fistulæ when they are present. There are some few instances in which a probe passed through the urachus from the umbilical opening has produced a metallic click, and could be felt with a metallic catheter passed into the bladder per urethram. The absence of local symptoms other than slight hemorrhage and a mass at the umbilicus adds greatly to the difficulties of differential diagnosis before operation.

The success of bismuth and  $x$ -ray as a diagnostic measure in disease of the gastro-intestinal tract suggested a new and efficient means of establishing and confirming diagnosis before operation, and was resorted to in this case with gratifying results. A sterile solution of bismuth subcarbonate was injected under slight pressure into the central depression of the umbilical stump, and an  $x$ -ray was immediately taken, with the result shown in the accompanying skiagram (Fig. 168). The bismuth can be seen in the fistulous tract apparantly communicating with the bowel. Fifteen minutes later an  $x$ -ray was again taken, and the bismuth was seen disseminated through the bowel, having left the fistulous tract extending from the umbilicus to the intestine. Eighteen hours later chemical examination revealed the presence of bismuth in the stools, establishing the certainty of this being a persistent, patent, omphalomesenteric duct.

Frequently the first evidence of possible embryonic remains in the umbilical region is ushered in by symptoms of obstruction or strangulation of intestine or strangulation of omentum without any external focal signs, and operation or postmortem affords



the only means of revealing the constricting bands or adhesions and associated pathology resulting from vitelline duct remains.



Fig. 168.—x-Ray plate after injection of bismuth suspension into sinus. Note bismuth shadows apart from the line of the sinus; apparently the suspension passed into the intestine and is being disseminated through it.

Following the diagnosis of these conditions the treatment is the most important consideration. Caustics and ligatures



Fig. 169.—Umbilicus and sinus freed; purse-string suture inserted at base of sinus.



Fig. 170.—Sinus is divided between clamps, the stump ligated and invaginated into intestine, and purse-string, after being tied, is overlaid by a row of Cushing stitches.



have been used extensively with the hope of effecting a cure, the instances of good results, however, being exceptional. Abdominal operation offers the only safe and certain way of dealing with these, establishing certainty of diagnosis and removing the possibilities of future complications. The use of the cautery has in a few instances been followed by permanently good results, but in the light of more recent and extensive experience this means of treatment will give way to early and complete operation. Operation is relatively simple and not fraught with danger except when resorted to to relieve obstructive symptoms after gangrene and infection are already present.

**Operation.**—An oval incision encircling the umbilicus and tumor was made, extending in an upward and downward direction as shown in illustration (Fig. 169). After entering the peritoneal cavity and locating the duct at point of attachment to the bowel, which was on the convex surface of the ileum about 1-foot from the ileocecal valve, it was clamped and ligated as one does the appendix in the ordinary appendectomy, surrounded by purse-string suture, and the stump cauterized and invaginated. This was followed by a longitudinal top-stitch and the abdomen closed in the usual way (Figs. 169 and 170).

If not operated, these conditions may persist for years without giving rise to serious complications, as is evidenced by one patient attaining the age of twenty-eight years before sufficiently distressed to seek relief. Early and serious complications are to be expected, and as soon as even a probable diagnosis has been established operation should be urged in the absence of good contraindications.

The child made an uneventful recovery, with prompt relief from the severe attacks of colic preceding operation, and is now living and well.

## CLINIC OF DR. B. F. LOUNSBURY

WASHINGTON BOULEVARD HOSPITAL

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### PLASTIC REPAIR OF THE HEEL

*Summary:* Demonstration of 3 cases in which large cutaneous defects over the os calcis have been repaired by the Italian method of skin transplantation; discussion of technic.

DURING the past five years I have had occasion to care for 3 unusual cases of injury involving the heel. The damage sustained was of such a character as to wholly incapacitate the man from physical labor, yet was not severe enough to warrant an amputation of the foot.

The problems to me were unique, and it is because of the unusual features of the cases that I thought them of interest enough to present to you. A brief history of the cases, with the methods employed, are as follows:

Our first case received an injury in 1913, which crushed the lateral side of the foot, destroying the distal end of the fifth metatarsal and little toe, and tearing away the entire pad of the heel and crushing the posterior tip of the os calcis. The ankle-joint and other structures of the foot were intact and the doctors in charge hoped to save a useful foot. At various times skin-grafts were applied until all the raw surfaces were covered. It was found, however, that an area over the end of the os calcis persistently broke down and remained as an open ulcer. The foot was in this condition in June, 1914, when he came under our care.

I had never before transplanted a flap over the end of the heel, but after placing the foot in various positions, decided that a flap could be elevated from the back of the thigh. This was done and the heel was held in a cast against the back of the



Fig. 171.—Case I. Diagram showing flap of skin from back of thigh in process of transplantation to cover cutaneous defect on the heel of the opposite foot.





Fig. 172.—Case I, Medial aspect of site of plastic five years after operation.



Fig. 173.—Case I. Lateral aspect of site of plastic five years after operation.

thigh for fourteen days, when union was firm enough to cut away the flap. Ultimately an excellent covering was developed for the heel (Figs. 171-176). When the patient was first permitted to step on the foot he was provided with an arch support



Fig. 174.—Case I. Plantar aspect of site of plastic five years after operation.

which helped to take some of the pressure from the heel. In September, 1915, he was again able to resume his work, and has never been obliged to lay off a day since that time on account of any trouble with his heel.

Gradually the transplanted skin has toughened up to meet

the demands of the pressure placed upon it, and he now has a very excellent weight-bearing surface in this transplanted tissue.

It was necessary to place the patient on his face with his leg crossed behind him and hold him in a cast. The discomfiture from this was extreme, and I thought at the time that if occasion ever again arose for a similar operation I should try to avoid keeping him on his face, as the position was difficult for the patient and made it difficult to care for him.



Fig. 175.—Case I. Scar on back of thigh five years after operation. It is supple and does not interfere with function.

In January, 1916, we received another patient who had the right leg crushed off below the knee and crushed off his left heel. The os calcis was cut through about midway between the anterior and posterior ends. The entire padding and soft tissues about the heel were destroyed. The question arose at that time of amputating the foot, but the doctors in charge decided to try to save it. He came under our care some time later, with an ulcer on the heel which could not be covered with skin because





Fig. 176.—Case I.  $\alpha$ -Ray of heel two years after operation. Note the increased density of the bone at the posterior end of the os calcis persisting as a relic of chronic infection incident to its exposure following the initial trauma.

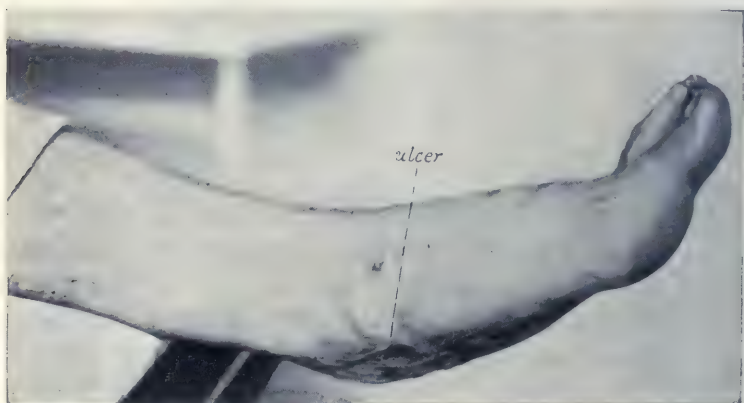


Fig. 177.—Case II. Medial aspect of heel before operation. Note ulcerated areas where previous Thiersch grafts have broken down.



Fig. 178.—Case II. Lateral aspect of heel before operation. Note ulcerated areas where previous Thiersch grafts have broken down.

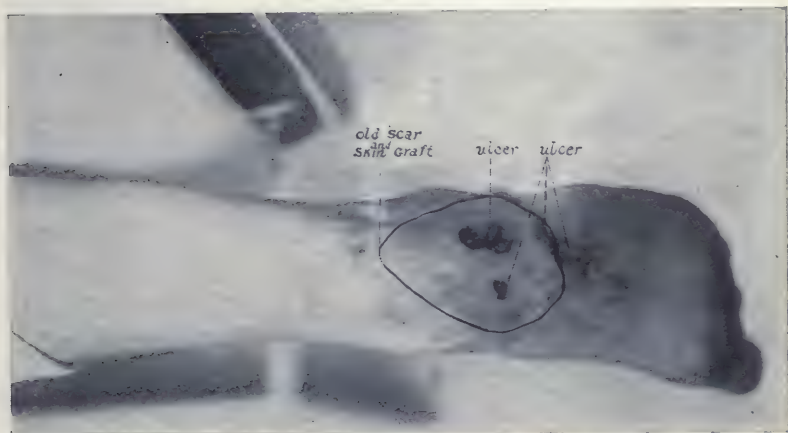


Fig. 179.—Case II. Posterior aspect of heel before operation. Note ulcerated areas where previous Thiersch grafts have broken down.



Fig. 176.—Case I. *x*-Ray of heel two years after operation. Note the increased density of the bone at the posterior end of the os calcis persisting as a relic of chronic infection incident to its exposure following the initial trauma.



Fig. 177.—Case II. Medial aspect of heel before operation. Note ulcerated areas where previous Thiersch grafts have broken down.





Fig. 178.—Case II. Lateral aspect of heel before operation. Note ulcerated areas where previous Thiersch grafts have broken down.



Fig. 179.—Case II. Posterior aspect of heel before operation. Note ulcerated areas where previous Thiersch grafts have broken down.



Fig. 184.—Case II. Nearing completion of second stage; flap has been freed from thigh and brought around heel by long tension sutures; coaptation stitches not yet in place.



Fig. 185.—Result in Case II eight months after operation.

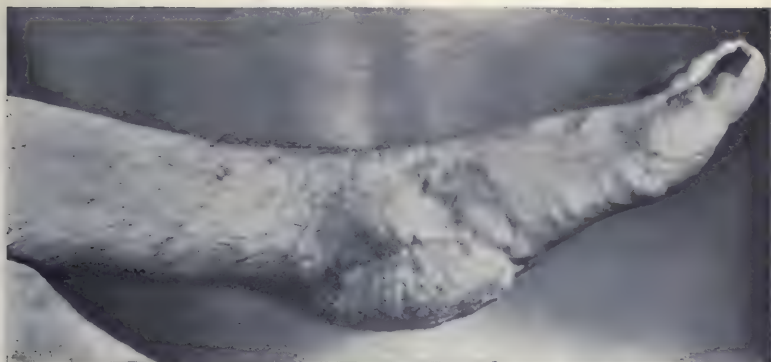


Fig. 186.—Result in Case II eight months after operation.



Fig. 187.—Case II. Deep scar on anterior surface of thigh eight months after operation. As this patient had lost the leg below the knee on this limb the scar shown here produced no inconvenience.





Fig. 188.—Case III.  $\alpha$ -Ray of foot before operation. Note changes in os calcis similar to but more marked than those in Case I.

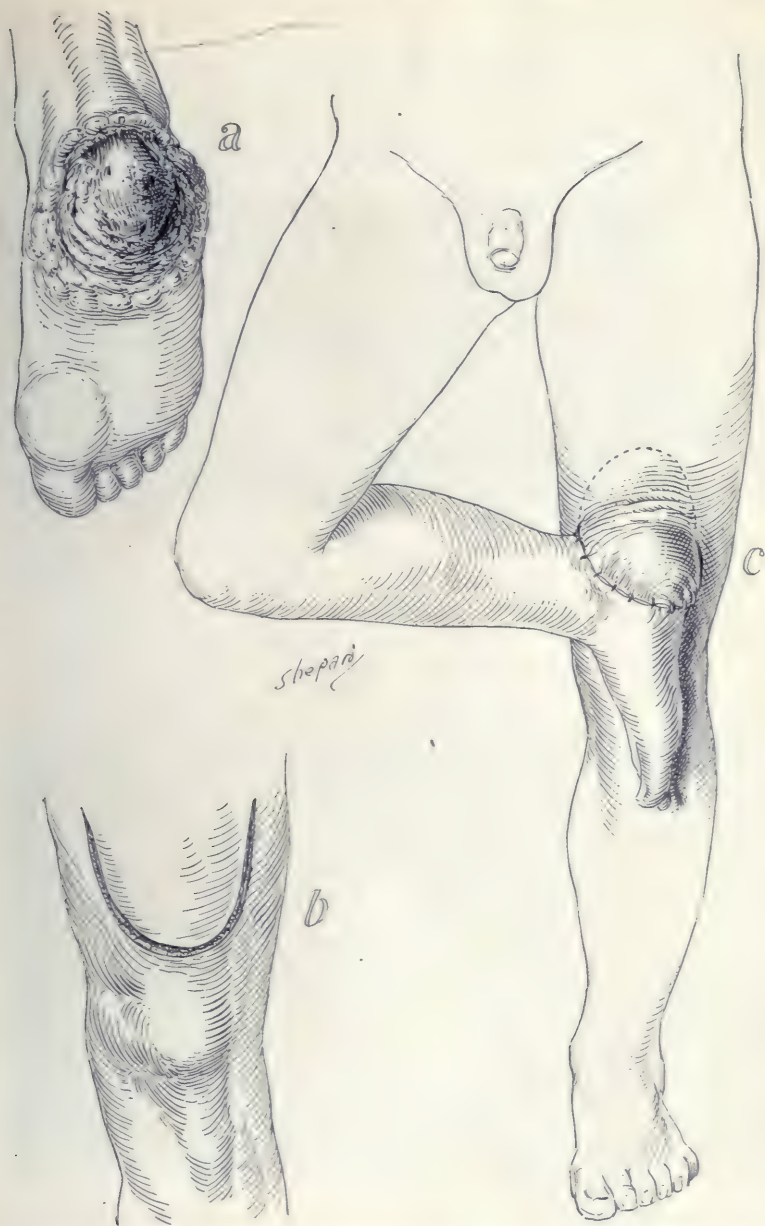


Fig. 189.—Case III. Details of operation: *a*, Defect in heel at beginning of operation; *b*, V-shaped incision on anterior aspect of thigh of opposite leg which outlines flap to be transplanted; *c*, first stage of operation completed; ready for application of cast.

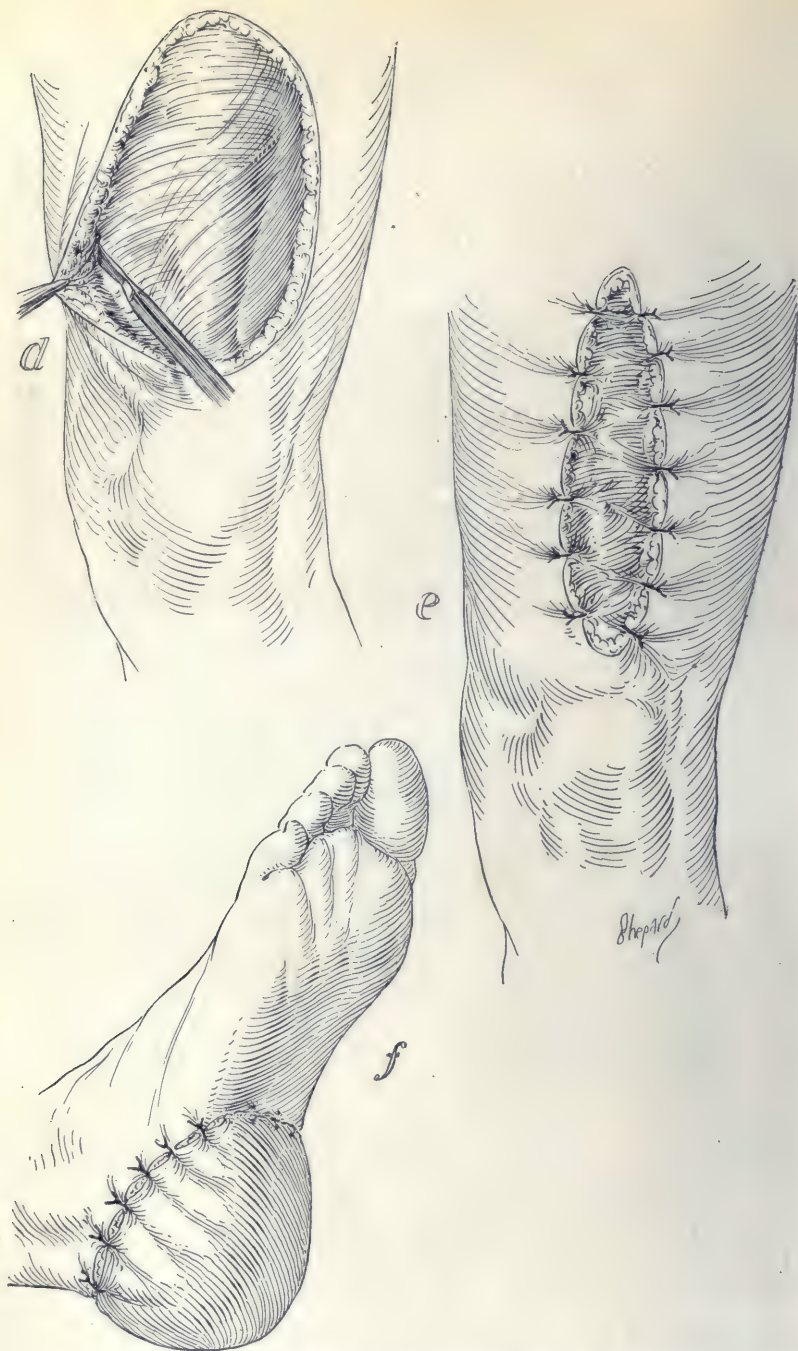


Fig. 190.—Case III. *d* and *e*, End of second stage of operation; pedicle of flap has been cut; the edges of the defect on the thigh are undercut, the skin mobilized and the defect closed as nearly as possible; any uncovered area may be closed by Thiersch grafts; *f*, flap freed and in place on the heel.





Fig. 191.—Case III. Condition about three months after completion of second stage of operation; flap healed securely in place.

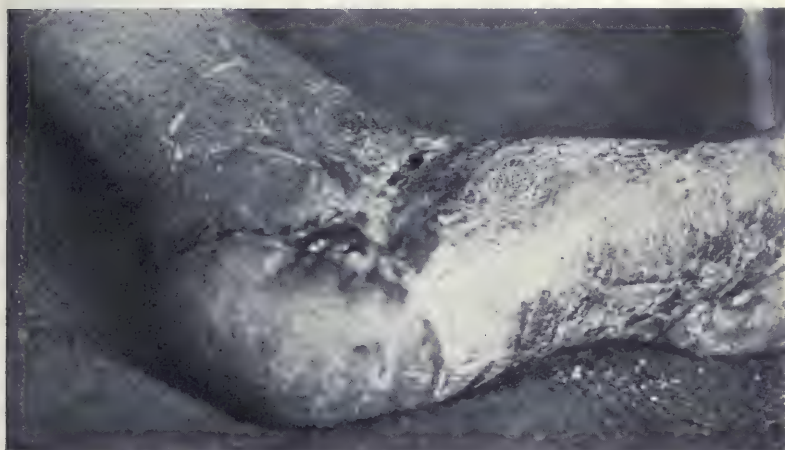


Fig. 192.—Case III. Condition about three months after completion of second stage of operation; flap healed securely in place.

of the dense scar tissue. Two and a half years after his injury he was still unable to use his foot, and was walking with an artificial leg and a pair of crutches. In July, 1918, we performed a flap operation to cover the heel. Hoping to obviate some of the difficulties encountered in the first operation, we sat the patient up and crossed his legs in front of the thigh, holding it in a cast.



Fig. 193.—Case III. Condition about three months after completion of second stage of operation; flap healed securely in place.

This was a great improvement so far as the position of the patient was concerned, but we found later that the pressure of the external malleolus over the front of the thigh was so great that it produced necrosis that reached to the femur and necrosed the skin over the external malleolus. It was necessary to take a large amount of flap away in order to cover this defect over the malleolus. Subsequently we skin-grafted the area over the front of the thigh, and there has been a full restoration of the function of the quadriceps muscles and tendons (Figs. 177-187).

About six months after this operation a case was brought to my clinic in Cook County Hospital for a curetment of the os calcis because of a persistent ulcer on the heel. Inquiry into the history showed that the patient had two years previously had the



Fig. 194.—Case III. Scar on anterior surface of thigh three months after operation; it has entirely healed, and though there is still considerable interference with the usefulness of the underlying muscles, function is rapidly returning to them.

end of his heel crushed off in an accident in Mexico, and though skin-grafts had been applied, an area of about 1 inch in diameter remained as an open ulcer. A radiograph showed that the periosteum over the end of the os calcis had been damaged and had produced a thickening in this region.



We decided that the only way to get a serviceable foot was to put a transplant over the denuded area. With our experience of the two previous cases we hoped to make this patient the most comfortable and avoid the sloughing which took place in the second. We turned up the flap from the front of the thigh, but padded well to keep pressure off the external malleolus. We found when ready to cut the flap down that, in spite of all our precaution, necrosis had taken place, as in the second case. Despite this we have secured a degree of healing which now seems certain to give a good functional result (Figs. 188-194).

## CLINIC OF DR. WILLIAM F. HEWITT

### PRESBYTERIAN HOSPITAL

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## INDICATIONS FOR CESAREAN SECTION

*Summary:* Three cases illustrating factors to be considered in deciding for or against cesarean section in the treatment of the complications of pregnancy and labor.

INASMUCH as the hardest problem in the cesarean section operation is knowing when to do it and when not to do it, I shall present 3 cases which, in view of the widely differing indications for operation proposed in different clinics, may be of interest to others as they were to me.

### CASE I.—CESAREAN SECTION AND PLACENTA PRÆVIA

The first patient was brought to my service at the Presbyterian Hospital in a condition of shock following a hemorrhage extending over about a week, and giving a history of repeated hemorrhages for several months previous to this. Upon vaginal examination a placenta prævia centralis was found, and upon abdominal examination an approximately seven-month fetus was palpated. A brief summary of the history follows:

Mrs. S. K. Present complaint: Escape of blood from the vagina; pregnancy.

Hemorrhages began about the middle of last October, about three months ago; continued two days; two napkins each day. Since that time about every three weeks has had a little bleeding. Patient states it was about 1 tablespoonful each time; 2 A. M. Tuesday morning began to bleed freely; continued for about two hours. Used five napkins, which were soaked. At this time had severe chill, and when she went to the toilet bleeding started. Wednesday morning at 12.30 hemorrhage started again; continued for two hours; used six napkins. Complained of pain over pubis.

*Pregnancy.*—Date of last menstruation was June 1, 1918. Will be full term March 7, 1919.

*Family.*—Has had 11 children, 6 of whom are living. Those dead died of bronchitis, accident, "summer complaint," and 1 lived only two hours; 1 died of pneumonia at one and a half years. Has had 5 miscarriages. One miscarriage between each of the births.

*Menstrual.*—Menstruates regularly every twenty-eight days; has much pain the first day of each period. Menstruated first at sixteen years.

*General.*—Appetite fair; bowels constipated; burning on urination—noted for last few weeks. Has been in sanitarium on account of pulmonary tuberculosis.

*Remarks on First Stage.*—Bleeding per vagina; cervix effaced; os two fingers' dilatation, but covered over by mass resembling placenta. Manipulation of this tissue caused free bleeding, so that she was packed with two pieces of surgical gauze—one knot. No pains noted during examination.

In this case one hesitated in doing a cesarean section, as there was so little prospect for a living child. However, as the woman was in bad condition and the os was only two fingers in diameter, I felt that cesarean offered the best prognosis for the mother. As tampon treatment followed by a version would probably have been a bloody procedure during the dilatation stage, and in boring through the placenta in order to do the version one would face the almost certain prospect of severe hemorrhage, I felt that there would be little hope for the mother; also that early version meant a high percentage mortality for the child. An immediate cesarean section, abdominal route, was therefore done under local anesthesia. The following operative notes were made:

Omentum adherent along the line of an old midline laparotomy scar. Uterus soft. Pituitrin (4 c.c.) injected into the anterior wall of uterus and uterus incised. Placenta very tightly adherent, centrally placed over the internal os. Removed in pieces with great difficulty. More hemorrhage than usual during removal. Uterus packed from above. Uterus very



small when retracted, edges approximated much easier than normally. Tubes crushed and tied with catgut, but not divided on account of religious scruples.

Child good size for six and a half months. Looked more like a seven and a half months' child. Made a few gasps and heart beat feebly for a while. Peritoneum was very friable and tore very easily while closing. Owing to the exsanguinated condition of the patient it was impossible to risk any anesthesia whatsoever and the straining prevented a good peritoneal closure. Anterior fascial closure was therefore made more secure than usual. Two gauze drains in wound, one at either end of incision.

Patient was then put in lithotomy position and the previously inserted vaginal and cervical pack removed. The uterine pack inserted from above was located and removed also. The uterus was then packed with silver nitrate gauze.

*Postoperative Course.*—A "normal" glucose solution (5 per cent.), 6 ounces, with 20 grains of sodium bicarbonate, was given per rectum until fluids were freely taken per mouth. This procedure is followed in all my operative cases, and there has been much less postoperative vomiting and acidosis since this has been done.

The results of the operation appear to justify its performance. I feel that there would have been almost certain death if we had done a version, on account of the extreme difficulty of separating this densely adhering placenta, *i. e.*, the postpartum hemorrhage would have been severe. The woman was sterilized, as she had a history of pulmonary tuberculosis. She has made an uneventful recovery.

#### CASE II.—ECLAMPSIA AND CESAREAN SECTION

This case is mainly of interest in view of the convulsions occurring in a case of pre-eclamptic toxemia undergoing treatment in the hospital with the blood-pressure falling. I saw this patient at about the eighth month and obtained the following history:

Mrs. E. L., aged thirty. *Present complaint:* Swollen feet and hands and headaches. Duration—two weeks ago first swelling appeared. Could not button shoes. Hands swollen to slight degree. Could not get rings off easily. Headaches—has always had them to some degree; have been no worse during this pregnancy than before.

*Menstrual.*—Began at seventeen years, every four weeks; duration six to seven days; two napkins. Always some pain. Not so painful after first baby was born. Pain during whole of period.

*Marital.*—Married at twenty years. First child now eight years old. No difficulty at labor, which lasted six and a half hours. Nursed baby nineteen months. Periods at eleven months after. Slight tear—unrepaired. No kidney trouble; no miscarriages; no fever. Some bleeding in November, 1917, at the sixth to eighth week; no bleeding afterward. Has had no leukorrhea until about a week ago; does not soil clothing. No backache. The urine contains albumin and a few hyaline and granular casts.

She went over to the hospital on the day on which I first saw her, and was put under a routine treatment consisting of sweats each day and sodium bicarbonate in sufficient amounts to alkalize the urine; also low protein intake and hydragogue cathartics. The systolic blood-pressure, which has been about 170, dropped to 120 in four days, but the albumin did not decrease, although the hyaline and granular casts disappeared. When I saw the patient at noon on January 29th she wanted to go home, as she felt so well. I persuaded her that she should stay. About 5 o'clock a headache developed. In the nurse's record I find the following statement:

This P. M. patient complains of severe headache, which was not relieved by aspirin and pyramidon. At 7.30 P. M. there was a convulsion lasting one or two minutes, in which there were clonic spasms, with retraction of the head, extreme flexion of the hands, "cracking" of the muscles of the shoulder, and nystagmus. This was repeated three times in the following forty-five minutes. The patient was in coma during this time

and up to 9 P. M., when she recognized her surroundings. The pulse varied between 140 to 160. One hypo. (1 c.c.) veratrone seemed to slow the pulse, and the patient did not have a convulsion following its injection.

This case, then, has interesting features from the standpoint of treatment, as there are two distinct methods of treating eclamptics. The older one, which consists in emptying the uterus immediately, and the Straganoff or expectant method, in which the patient receives treatment as for nephritis, with the addition of depressant drugs, such as the bromids, chloral, and even morphin. No operation is done save easy ones in labor. Interruption of pregnancy is not usually performed. I have seen excellent results follow this latter method during my assistantship at the Glasgow Royal Maternity Hospital where there is an abundant number of eclamptics. From my experience I do not feel that traumatic shock-producing or acidosis-producing operations are anything but hazardous for an eclamptic. However, in this case we have not "many more shots in our locker," as the case has been under treatment for four days. Statistics and my experience agree that if the labor or pregnancy is terminated by cesarean section, the most opportune time is at the *onset* of the convulsions. Therefore I did an abdominal cesarean section under local anesthesia on a comatose patient, and delivered a live child which weighed 4 pounds, 10 ounces. Before operation what were believed to be the fetal heart tones were heard in the L. L. Q. at the rate of 140. Section was done under local anesthesia entirely. The infant gasped shortly after delivery, but there was considerable meconium and mucus in its throat. It was never very blue and became red quite rapidly.

The patient made an uninterrupted recovery, has had no further convulsions, and her systolic blood-pressure is now 130. The baby is beyond the birth weight at ten days and is now apparently healthy.

Vaginal cesarean at the eighth month is more traumatic to both mother and child than the abdominal cesarean, and the latter is, therefore, the operation of choice at this period.



CASE III.—DYSTOCIA, THREATENED RUPTURE OF THE UTERUS,  
AND CESAREAN SECTION

History of previous child bearing and present confinement:

*Four years ago:* First child (boy); delivered by forceps operation after an eighteen-hour labor; child dead. Doctor in home—was there twenty-four hours before operation.

*Three years ago:* Boy—born after fairly short labor; living and well.

*Twenty months ago:* Boy—twenty-hour labor; living and well; said to have weighed  $7\frac{1}{2}$  pounds.

*This labor:* False pains ten days ago. Labor began 2/5/19 about 3 A. M., but such pains as disturbed the sleep only. At 6 A. M. definite regularity of pains.

8 A. M.: Spot of blood and some slime. Pains of twenty minutes.

9 A. M.: 3 grains of quinin given by students (of own accord).

10.30 A. M.: Seen by intern—vaginal examination. Cervix not effaced, dilatation three fingers. Head not engaged. Given 30 grains of chloral hydrate per rectum. Said to have been expelled. Pains five to ten minutes.

3 P. M.: Pains of three minutes. Seen by intern. Examined rectally. Dilatation size of dollar, not effaced; head just reached by finger, not firmly engaged. Given 20 grains of chloral hydrate by mouth at 4.30 P. M. Pains more intense, but patient slept about three-quarters to one hour.

6 P. M.: Membranes ruptured spontaneously.

10.30 P. M.: Vaginal examination by intern. Os nearly dilated, admitting whole hand; sagittal suture near promontory nearly transverse. Anterior fontanel posterior to right, head military, face to right, parietal bone (right) presenting.

11.15 P. M.: Given  $\frac{1}{8}$  grain of morphin.

2 A. M. (2/6/19): Given  $\frac{1}{8}$  grain of morphin sulphate before ambulance ride.

*Heart tones:* Heart-beat to the left of midline in lower quadrant, 130.

*Patient:* Went to stool often, and said with success as to

urination. Pains became irregular. Brought to hospital in police ambulance at 4 A. M. (2/6/19).

5 A. M.: Examined by intern. Prominence resembling a full bladder on pubis. Catheterized; 100 c.c. urine obtained; could not eradicate tumor. Prominence still dull on percussion.

Abdominally—left position—shoulder in midline.

Heart tones good—128.

Rectally—head has a good-sized caput. Cannot be disengaged.

No cervix felt vaginally. Head  $2\frac{1}{2}$  phalanges from outlet—considerable caput. Os completely dilated. Parietal bones overlapped—sagittal suture near promontory.

Conjugata—Diagonalis 10.5 cm. (approximately).

Sacrum bent sharply just below promontory—deflexion is slight—in all probability less than previously. Occiput is 1 inch nearer than sinciput.

8 A. M.: Examined rectally by Dr. Hewitt; 50 c.c. bloody urine by catheter.

*Uterus* tight about child; distinct furrow at about the level of the navel transversely. Tumor below navel.

This case is interesting from the fact that the patient had already had several successful labors, the first only being instrumental, and resulting in a dead child. This patient was in labor a total of twenty-eight hours, so far as her history shows. The head was in anterior parietal bone presentation, which often occurs in a rachitic flat pelvis. The caput was so marked that the senior intern called up, on admitting the case to the Presbyterian Hospital, that the head was  $2\frac{1}{2}$  phalanges away and that the case would easily deliver. There was a well-marked suprapubic tumor which he thought was a bladder. Catheterization, however, did not reduce the size of the suprapubic tumor, but the intern felt this might be due to pressure of the head upon the catheter. The junior intern, who had been watching the case in the home very closely, said that this suprapubic tumor only arose when the patient was nearing the hospital in the ambulance, and the patient voided only shortly before leaving for the hospital. When I palpated the abdomen there was con-

siderable difficulty in distinguishing whether all the suprapubic tumor was Bandl's ring and a dilated lower uterine segment, or partly Bandl's ring and partly distended bladder, as the subcutaneous fat was so plentiful. By rectal examination the head seemed fixed, but upon easy pushing of the head it was apparent that it could be displaced. There was a diagnosis then made of threatened rupture of the uterus with an anterior parietal bone presentation in a patient who had had three vaginals made, and in whom the membranes had been ruptured for twenty-four hours. There were three possibilities to consider—forceps, version, and cesarean section. Version was contraindicated, as we had a threatened rupture of the uterus. Forceps were not used, as the greatest diameter of the head had not entered the inlet, and although the head was only  $2\frac{1}{2}$  phalanges away, forceps would only have been successful if they had been sufficiently crushing to permit dragging the too large head through a too small inlet. Such a procedure promised cranial damage and maternal laceration. Cesarean section was therefore done under local anesthesia. By this time Bandl's ring was two fingers above the umbilicus. I present the operative history:

Abdominal cesarean section at 9 A. M. Fetal heart rate 156 to 160; maternal heart rate 140. The indications for operation were a flat pelvis, obstructed labor, and threatened rupture of the uterus.

*Condition of Patient.*—There was a deep crease in the pregnant abdominal tumor. This was at first considered to be a full bladder. However, two attempts at catheterization failed to eradicate the suprapubic prominence. The crease lay 7 inches above the pubis. The fundus uteri above the crease was in a state of continuous contraction. No relaxation could be detected on long palpation.

*Operation.*—Cautious, thorough, unhurried local infiltration with novocain kept the patient from suffering much pain additional to that of the constant uterine contraction.

The peritoneum was incised carefully near the fundus uteri. On exploration, the bladder was found to be drawn up to a



point 6 inches above the pubis. Thus the skin incision was perforce carried high above the navel to admit of delivery without bladder injury. Tetanus uteri was better demonstrated on actual palpation. The fundal musculature was all in a bunch. Approximately  $3\frac{1}{2}$  inches of the thin lower uterine segment was palpable above the plica vesico uterina; on incision the fundal musculature was found to be about  $2\frac{1}{2}$  inches thick, while the lower uterine segment was not over  $\frac{1}{4}$  inch thick.

Delivery of the child was accomplished without difficulty in dislodging the head.

The recti were dissected out with some difficulty, but finally brought together in a satisfactory manner.

The thin fascia above the umbilicus gave some difficulty in closure, but the thoroughness of the previous local infiltration together with the remarkable co-operation of the patient combined in allowing a quite satisfactory peritoneal closure.

The tubes were divided and buried at the express request of the patient that she be allowed to have no more children.

The child was born covered with meconium and with meconium and mucus in its pharynx; artificial respiration was necessary. Its head was greatly misshapen, bulging to the right. The right parietal bone was the bulging part. There was a distinct pressure furrow at the base of the bulge. To the left, about the middle of this parietal bulging, was a dry place about 1 inch in diameter, dark red, with  $\frac{1}{4}$ -inch light red border, resembling a pressure-spot from resting on the promontorium sacri. There was no "whining" by the child after delivery.

No pituitrin was injected into the body of the uterus, as the uterus was in tetanic contraction. As the patient's pulse, at first 90, had risen to 140, and respiration had increased even before operation, I felt that a hysterectomy should not be done.



## CLINIC OF DR. V. D. LESPINASSE

### NORTHWESTERN UNIVERSITY MEDICAL SCHOOL

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#### STERILITY<sup>1</sup>

*Summary:* Methods of determining the cause of sterility in male and female; technic of uterine insemination; treatment of sterility in both sexes.

I WISH first to express my appreciation of the honor of receiving this invitation to address the Medical Officers of the Great Lakes Naval Training Station, and shall aim to give you some new ideas, to show you what we have accomplished in our endeavors to relieve the distressing condition of childlessness. Folk-lore has taught that sterility was always due to the woman, and medical men until very recently have accepted this legend and used it as a basis for treating only the woman. As a matter of fact, about half the cases are due to faults in the woman and half to faults in the man. When a couple present themselves for examination there are three major things to be ascertained: First, is the fault in the woman; second, is the fault in the man; third, is the fault in this particular combination.

In the examination of the woman the first thing to investigate is the condition of the ovary. First, let me say that the anatomic and physiologic conditions in a woman are such that any opinion as to her fertility or sterility is subject to much more uncertainty than a similar opinion in regard to the man. You examine a man, and when you are through you can say: This man cannot have a child. You cannot be so positive after examining a woman, because the anatomy and physiology of the female genitalia are so different from man. What can we tell about the condition of a woman's ovary as regards reproduction? In some ways we can tell a great deal; in others we can only arrive at an opinion by exclusion. The ovary is a dual functioning

<sup>1</sup>Clinic given before the Medical Officers of the Great Lakes Naval Training Station, February 27, 1919.



organ, producing the ovum and also an internal secretion. Many women who are sterile from congenital ovarian disease have many of the secondary sex characteristics of a man. They are inclined to have a beard. Their pelves tend to be of the masculine type. Their voice is a trifle heavy. Their breasts are small and their menstrual function is not normal, usually being scanty and the interval prolonged.

The ovary may produce a perfect internal secretion, but be deficient as regards the production of ova. This is the type of case due to a congenital ovarian defect of both elements of the ovary. This condition can be absolutely proved by laparotomy, when one will find the ovary small and hard and with very few graafian follicles in it. The commoner condition is, in my opinion, deficiency in the production of ova, while the internal secretion is produced and utilized by the individual. This type of woman will be perfectly normal as regards her menstruation, her sexual desires, and her feminine secondary sex characteristics are normally developed, but she does not conceive when everything is apparently favorable to conception. What produces this clinical condition? Is it a congenital deficiency in the production of ova, or are there adhesions around the ovary or is the fimbriated end of the fallopian tube closed by adhesions? At least something is wrong either in the production of the ova or in their transportation. Can this deficiency of ovulation be due to some disease that interferes with the ovary? Adhesions around the ovary that strangulate the blood-supply will produce a condition in the ovary known as multiple cysts. An analogous condition can be produced in the ovary of a guinea-pig by starving the pig for five or six days, giving it just enough food to keep it alive. Then feed it up, and at operation you will find the same condition in the ovary that you see so frequently in gynecologic cases, the ovary just studded with small cysts. If a woman goes through a long period of severe physical strain or debilitating illness this cystic condition may develop in the ovary. The diagnosis of these ovarian conditions can be strongly suspected from the history and made by exclusion after a long and exhaustive study of the particular case.

Obstruction in the fallopian tube is a common cause of sterility in women. If you have a history of a pelvic peritonitis, you may have an obstruction in the tube due either to a closure of the fimbriated end of the tube, or the tube may be constricted by a band of adhesions. These women menstruate normally and there is nothing about their secondary sex characteristics that is unusual or abnormal. The lesion in this instance may be detected by bimanual examination, but the chief point is the history of previous pelvic infection of some type. The absolute diagnosis is made by exclusion and confirmed by laparotomy.

The purpose of the uterus is to prepare a nest for the impregnated ovum when the impregnated ovum comes into the uterus. The ovum elaborates an enzyme that absorbs the endometrium at the point of contact. If this enzyme is not produced or is prevented from functioning, you will have impregnation, but no pregnancy. The ovum will continue on down and be lost. This condition clinically is called defective implantation and is closely allied to a condition known as irritable uterus, where the ovum implants and develops for a week or two and then aborts. I know of a woman who has had sixteen pregnancies in nine years of married life, and as yet has never had a baby. She conceives very readily, but she has what the obstetricians call an irritable uterus. What that means I do not know; whether it is some defect in the enzyme production or whether it is an endometritis or the lack of some hormone due to premature destruction of the corpus luteum I do not know. You know when a veterinarian performs an abortion on a cow he does not touch the ovum or enter the uterus; the veterinarian simply puts his hand into the rectum and squeezes out the corpus luteum from the ovary and the very next day the cow aborts. Perhaps something destroys or inhibits the growth of the corpus luteum in defects of implantation.

Clinically, we recognize an implantation case by the following data: In the history the point is usually brought out that the woman frequently goes over a few days or a week, and then there is a slightly larger flow than is normal. This fact, together with

negative data as to cervix, secretion, uterine position, and normal spermatozoa, should make one strongly suspect an implantation defect.

To diagnose ovarian and tubal causes of childlessness requires several séances and the intelligent co-operation of the patient. First, we must have normal spermatozoa; second, the spermatozoa must be obtained active from the cervical canal three or four hours after coitus. Sometimes you can obtain the spermatozoa from the uterine fundus, if you care to do it, but this manipulation requires a special technic and is not adaptable as a routine procedure. You should have made four or five injections of spermatozoa into the uterus at appropriate times. If after all these conditions have been fulfilled the woman does not conceive, you know the trouble is in the tube or ovary, and to make a differential diagnosis between these two locations you must do a laparotomy. Laparotomy for sterility in woman should not be performed until all these examinations and manipulations have been performed as preliminary diagnostic tests. After you have studied the patient as outlined above, you can perform a laparotomy, and when the abdomen is opened one knows just where and what to look for.

The cervix conditions that cause childlessness are well understood. The pinpoint os and small defects in the cervical canal have been described frequently as to their etiologic relation to sterility. It is difficult to say how small a cervical opening will prevent the entrance of spermatozoa. Dilatation of the cervix, in my opinion, is not certain of results, as the dilatation frequently does not persist. Why not put 3 or 4 drops of semen into the uterus with a catheter and let the baby dilate the cervix thoroughly for the second child? Plastics on the cervix, like Pozzi's operation, are unnecessary if you will use uterine insemination, because insemination will do all that any cervix plastic will do to relieve sterility.

Just a word in regard to uterine insemination: The general public does not look at insemination in the frank mechanical way that the physician does. Sexual intercourse is such a complex act as regards the psychic side that the laity overlook the



fact that in its essence coitus is a purely mechanical process. It does not make any difference whether the spermatozoa arrives at the uterine fundus by its own power or whether it is thrown there through a rubber tube, but some women will not permit an intra-uterine injection of spermatozoa, as according to their ideas the baby would be marked or something terrible would be wrong with it. This is an erroneous idea, as all the uterine insemination babies that I have seen have been perfectly normal.

The next step in the examination of a childless couple is what we call "the combination." You have examined the man and he has normal spermatozoa. You have examined the woman, and as far as can be told she is normal. Now one must determine the reaction between the spermatozoa of the particular man and the cervical and vaginal secretions of the particular woman. This method of examination was developed by Dr. Max Huhner and is known as the "coitus test." It is simple enough. The couple has intercourse in a normal manner in the morning, and then the wife comes to the office three or four or any time up to eight hours after—best about three or four hours. She is placed on the table in the Sims position, the vagina opened, the cervix exposed, and whatever material is adherent to the cervix is taken on a wire and an examination made for spermatozoa. Material is also taken from inside the cervical canal and from the vagina. At the end of an hour there should be a good deal of semen in the vagina. The only spermatozoa that are alive in the vagina after one and a half hours, as a rule, are those that have been protected from direct contact with the vaginal secretions by the clotting mechanism of the semen itself. The cervical canal should be teeming with spermatozoa from one to three hours after coitus. They remain in the cervix alive and motile up to five or six hours, so that at the end of four or five hours you should find the cervical mucus alive with spermatozoa that cross the field in ten seconds. If one finds the spermatozoa all dead, then one knows that there is something in the woman's vaginal secretion or cervical secretion, whichever it is, that is destroying the motility of the sperma-

tozoa, provided, of course, you have made a check and found the spermatozoa normal in the condom or bottle.

*Head Conditions and Diseases in the Male Causing Childlessness.*—In the male there are two main elements to be considered: first, the production of spermatozoa, and, second, the transportation of the spermatozoa. The production of spermatozoa is a very complicated physiologic process and defects may occur in any stage of the process. The production of spermatozoa depends on a great many factors: first, the age of the individual; second, the hormone balance; third, the internal secretion balance; fourth, diet; fifth, general mode of life; sixth, amount of sexual stimuli. One can modify spermatogenesis for the better to a certain extent by diet and exercise, and the feeding of some of the glands of internal secretion. I have never been able to bring spermatozoa into the semen that did not have some kind of spermatozoa present before. But where the spermatozoa are deficient in vital strength or deformed we have been able to improve their morphology and motility markedly by these methods. When the spermatozoa are first produced in the testicle they take an eosin stain. Sometimes you will find this condition persists and the ejaculated spermatozoa are eosinophilic. Something has interfered with the normal development of the spermatozoa to produce this change.

*The Transportation of Spermatozoa.*—The route traversed by the spermatozoa from the testicle to the urethra is a long and tortuous one. In its course the spermatozoa comes into contact with many secretions. The first is the secretion from the epididymis. The epididymis is more than the simple tube it appears to be. It produces a thin glycerin-like secretion that is essential to the proper development of the spermatozoa. Spermatozoa taken from the epididymis' tail will impregnate. Clinically, your male cases divide themselves into two classes—those where spermatozoa are present and those where spermatozoa are absent. The sperm-present case we will put aside for a moment and take up the group where the spermatozoa are absent (azoospermia). The fact that spermatozoa are absent from the semen is all you can determine about this type of case clinically. As far as the sterility side is concerned, you know right then and

there that that man is sterile. You do not need to examine the woman until his condition is corrected.

The next question confronting one is: Is this a production or a transportation case? We first examine the testicles and see if they are normal in size, consistency, and sensitiveness. The testicle that is producing spermatozoa is elliptic, relatively soft, and is quite sensitive. The testicle that is not producing sperm has a tendency to be hard, globular, smaller and less sensitive. Then your secondary sex characteristics, are they well developed? Has this man all the secondary sex characteristics he should have? Has he a very scanty beard, a feminine pelvis, or a feminine voice? Is he real fat or real thin? Is the penis well developed or underdeveloped? What about the development of the thyroid gland? If you find any of these phenomena then you can feel sure that you are confronted with a case of deficient production of spermatozoa. The only way to be certain, however, is to operate on that man, cut down, see the testicles, and particularly the epididymis; aspirate the epididymis tubule in several places. If you do not obtain any spermatozoa, then you know it is a production case and relief is impossible.

The transportation case will usually give a history either of injury or of infection. When you operate you should determine the point of obstruction, and naturally the operation necessary for relief depends on the anatomic location of the obstruction. If the obstruction is in the epididymis, either vaso-epididymostomy or rete testis, union with the vas will be necessary; if in the scrotal vas, a resection and end-to-end union; if in the pelvic vas, the author's sac operation or intradermal implantation of the vas should be performed.

The apparatus we use for direct uterine insemination is a special catheter with a capacity of about  $1\frac{1}{2}$  minims. The patient is placed in the Sims position, the cervix exposed and grasped with a tenaculum, and the catheter inserted into the uterus through the cervical canal. This manipulation must be done with extreme gentleness or a severe uterine colic will result. The amount of semen injected is about 5 minims. If you inject more than 10 minims you are certain to have a severe reaction.





## CLINIC OF DR. WILLIAM M. HARSHA

ST. LUKE'S HOSPITAL

### FRACTURES

*Summary:* Three cases illustrating the value of patience and mechanical ingenuity in the treatment of fractures; method of correcting deformity by extension in a cast; angular deformity overcome by cutting cast on concave side and bending to the necessary degree.

CASE I.—H. S., aged sixty-nine, admitted to the hospital October 25, 1918. Hurt the same day in an automobile accident, sustaining a fracture of the surgical neck of the left humerus.



Fig. 195.—x-Ray findings in Case I.

There was the usual internal displacement of the upper end of the shaft toward the axilla, with internal rotation, but, as seen from the plate (Fig. 195), no overlapping of fragments.

Rotary displacement can only be properly diagnosed by stereoscopic *x*-rays.

Under anesthesia the arm is abducted and rotated outward; the fracture is easily reduced. Extension is maintained by adhesive strips reaching from the site of fracture to the elbow, with counterextension by a sling under the well-padded axilla. The entire arm, flexed at the elbow, together with the chest, is



Fig. 196.—Method of reduction in plaster body cast.

now encased in plaster; the upper arm in moderate abduction. This leaves the hand free, and in a convenient position for such use as it can serve with the arm fixed (Figs. 196, 197).

Assuming we have a good position of the fragments the cast will not be disturbed for ten days, when the cast will be cut from the lower arm so as to permit motion at the elbow. In three weeks the outer half of the cast will be cut away, exposing the shoulder and admitting of passive movement, and massage of



all the arm and shoulder that is accessible. Traumatism about the shoulder, with too long fixation, may permanently impair function, and at least unnecessarily delay the return of the arm to usefulness. At the end of another week the body cast will be removed, leaving only an angular splint support to the upper arm, which is maintained in position by a spica bandage or adhesive plaster. Further movement and massage will restore the use of the arm in about six weeks from the time of the injury.



Fig. 197.—x-Ray plate after adjustment.

CASE II.—C. R., male, aged forty, admitted to St. Luke's Hospital October 9, 1918. Was run over by heavy auto truck, the wheels passing over both thighs, crushing both femurs, involving the middle and lower third of each. There was extensive comminution of both bones and severe crushing of the soft parts, but neither fracture was compound. The patient was in rather profound shock, but rallied enough to warrant reduction on October 10th, the day following the accident.

Reduction was made on the Hawley table, which provides

for extension and counterextension, abduction, suspension at the knees, and also for the application of a plaster cast, by dropping the lower two-thirds of the table-top (Fig. 198). A plaster cast was applied.

It was thought the cast extending from ankles to waist-line, with flexion at the knees, would obviate the need of further ex-



Fig. 198.—Method of reduction with the Hawley table, which provides for extension and counterextension, abduction, suspension at the knees, and also for application of plaster cast by dropping the lower two-thirds of the table-top (Case II).

tension. This was true of the left leg, which united without change of position of the fragments. The right, however, retracted before union took place, and further correction was necessary.

The swelling of the limbs was very great, and when it subsided, and the further atrophy of the muscles from disuse had occurred, the cast did not fit closely enough to hold the right

leg in extension. It is necessary in such cases to provide for extension in addition to that afforded by the plaster.

It is the rule that a fracture, after proper reduction and thorough fixation, causes little pain. This patient suffered very little pain for a week or two after the reduction, considering the magnitude of the injury. At the end of three weeks, however, he complained of severe pain in the right leg, and on opening the cast the leg was found to be so reduced in size that the cast no longer held the fragments in position. The upper half of the cast was cut away longitudinally to the hip, moleskin applied for extension to the sides of the leg up to the knee, and after padding at the sides of the leg, plaster of Paris was re-applied, including the lower half of the cast.

After this there was no further pain. The extension of 15 pounds was maintained for three weeks.

The x-ray of the left leg after the cast was put on showed a slight deflection or angular displacement of the lower fragment. The cast was cut through in a circular manner about three-fifths of the circumference on the outer or *concave* side of the displacement, opposite the break; and the angular displacement corrected by bending the uncut part of the cast. Additional plaster reinforced the cast.

This method of correcting fractures that present angular displacement after the application of a cast is much better than to remove the cast and try it over.

The left leg was left six weeks, when the upper half of the cast was cut away longitudinally, and massage and slight movement started. He now has good union in both legs, with slight deformity in the right leg, but only  $\frac{1}{2}$  inch difference in length. In such cases it will not always be safe to rely upon the cast, with some flexion at the knees, to maintain the position. It will be sufficient in a simple fracture with little injury to the soft parts, and little swelling; but the greater swelling subsides, and there is always some shrinking of the limb from disuse. These two factors soon make a misfit of the cast. Therefore it is safer to apply extension plaster at the beginning. By exposing the anterior superior spine of the ilium and the internal



malleoli, careful measurements will determine any difference in the length of the limbs.

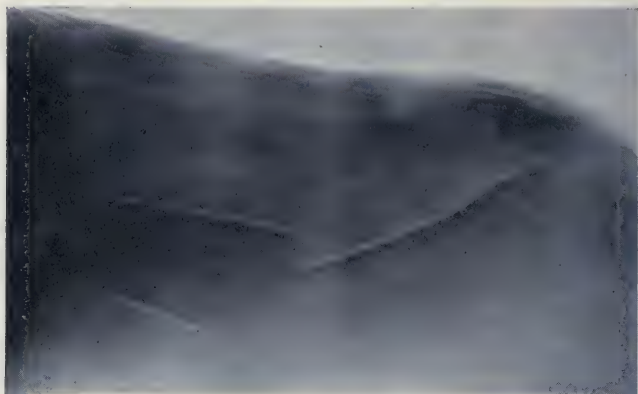


Fig. 199.—Anteroposterior x-ray of left femur before reduction (Case II).

I do not know if the plan of correcting angular or longitudinal displacements after application of a cast, as described here, is new or not. If not new, I have not seen or heard of it before.



Fig. 200.—Anteroposterior x-ray of left femur after reduction (Case II).

If the x-ray shows an angular displacement, about one week should elapse before a correction is made. This is to allow time

for shrinkage of the limb somewhat, and for some fixation of the broken ends of the bone (Figs. 199-204).

CASE III.—L. E., male, aged twenty-five, aviator, admitted to St. Luke's Hospital October 10, 1918. His airplane fell 300 feet, side slipping. He had several fractures, including the upper alveolar process in front, the rim of the left acetabulum, with fissure of the acetabulum, a Potts of the left ankle, and a



Fig. 201.—Lateral *x*-ray of same limb (Fig. 200) after reduction and application of cast (Case II).

transverse fracture of the left humerus. Figure 205 demonstrates the condition of the arm as found in the *x*-ray which was taken October 10, 1918, the day he entered the hospital. The fracture was reduced with a plaster body cast after the method described in Case I, on October 19th, nine days after the accident. The results after reduction are shown in Figs. 207 and 208.

Correction of the angular displacement was done, as in Case II, about a week after the cast was applied.

Only the last of the cases shown would have been easy to treat in an open manner by plate or wire. The anatomic result is good. He also has a good functional recovery.

The delay in putting it up in a plaster cast was because of the severe shock and great swelling.



Fig. 202.—Lateral x-ray of left femur after correction by cutting three-fourths of circumference and bending, October 18, 1918 (Case II).

The body cast, which I have used many times in fracture of the humerus, clavicle, and scapula, has seemed to fix and hold the fractures better than any device I know. It enables the patient to use the hand and fingers, and the patient is encouraged to do so.

The correction of the angular displacement is easily done by cutting the cast transversely *on the concave side* after the



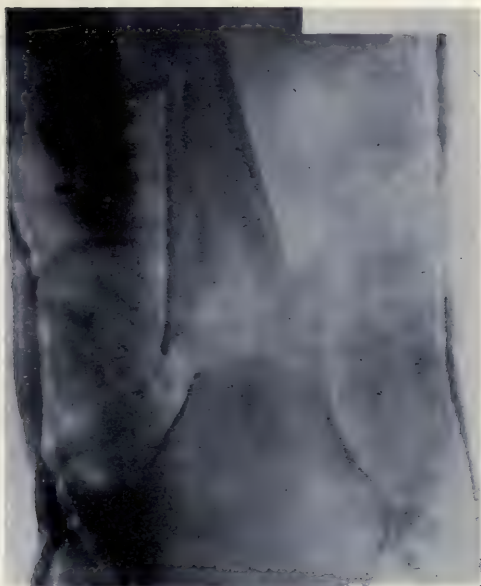


Fig. 203.—Anteroposterior x-ray of right femur before correction (Case II).

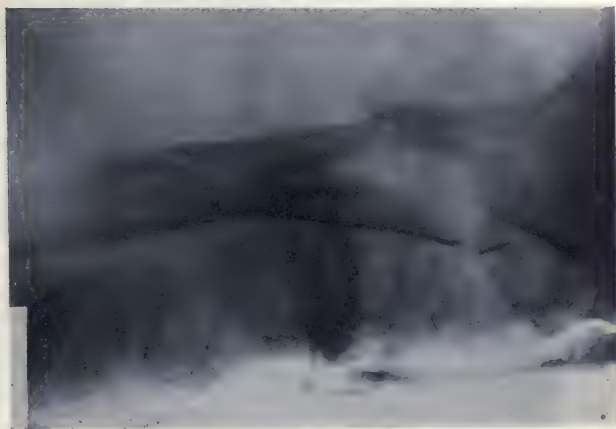


Fig. 204.—x-Ray of same (Fig. 203) after adjustment in cast (Case II).

swelling has had time to subside, usually about a week, being careful to leave one-fourth of the circumference of the cast uncut, and so placed that the bending will be properly directed.

By leaving on the moleskin plaster used for extension, as shown in Fig. 196 (Case I), a longitudinal displacement can be corrected by cutting away the posterior half of the cast on both upper and lower arm, except to leave a cuff of the cast at the

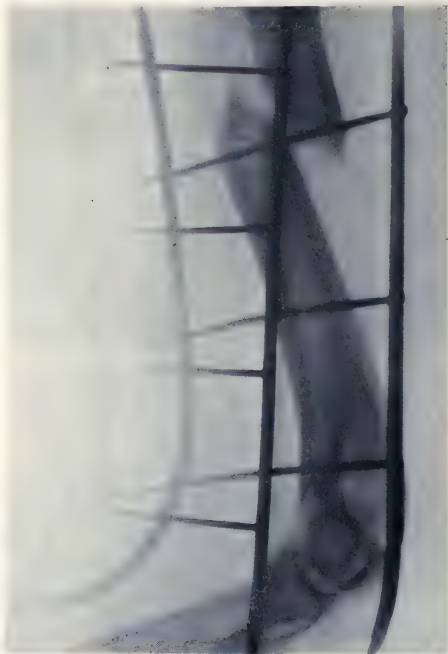


Fig. 205.—x-Ray of arm as it was found when patient entered the hospital October 10, 1918 (Case III).

wrist. After the cast has been so cut away, extension is made on the arm and a pad placed between the forearm and remaining anterior splint. The body cast provides firm counter-extension.

Open operation must often be resorted to where fragments cannot be approximated or held, where there is intervention of soft parts, or in ununited fractures. However, there have been



Fig. 206.—The fracture as reduced with plaster body cast, as shown in Fig. 196 (Case I), October 19, 1918 (Case III).



Fig. 207.—Anteroposterior x-ray after correction by cutting cast as in Case II (Fig. 202), October 25, 1918 (Case III).



many fatalities from what I believe to be too frequent open treatments; and in my opinion the number of cases requiring



Fig. 208.—Lateral view of same (Fig. 207) (Case III).

operation can be greatly reduced by patience and ordinary mechanical ingenuity.

## CLINIC OF DR. THOMAS J. WATKINS

ST. LUKE'S HOSPITAL

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### THE CARE OF SUPPURATING WOUNDS FOLLOWING ABDOMINAL SECTION

*Summary:* An infected laparotomy incision following hysterectomy for cancer—treatment by moist dressings—fallacy of removing sutures, inserting drainage, reopening wound, and irrigation.

THE following case well illustrates many of the points which I desire to discuss in the treatment of infected wounds following abdominal section.

Mrs. G., aged thirty, was referred to me January 8, 1918. She had a large carcinoma of the cervix uteri, which had been growing rapidly and which was bleeding profusely. No children, one miscarriage produced three years ago. The bleeding had existed for one year.

Upon examination the cervix was found to be from 2 to 3 inches in all diameters; 50 mg. of radium were inserted, sutured into the cervix, and left for twenty-four hours. A small amount of tissue was removed for microscopic diagnosis and found to be cancer. The Wassermann test was negative. One week later a radical operation was performed.

Sections of the tissue removed at this time did not show extensive changes from the radium, which is usual, as, clinically, not much change in tissue is found for at least one month following radium applications.

On the third day after operation the temperature was elevated and remained so for three or four days, when a large amount of pus escaped from the abdominal wound. Suppuration in abdominal wounds following hysterectomy for cancer is common, as cancer of the cervix is generally infected and contamination is usual.

The treatment of suppurative wounds consists chiefly in an avoidance of the procedures which are commonly employed in such cases; that is, no sutures are removed, no drainage is inserted, the wound is not opened, and no irrigation is made. The treatment used is moist dressings, which are placed over the wound as soon as any evidence of infection is discovered. The wet dressings are covered by protective tissue or paper to prevent evaporation. They are changed as often as necessary to keep the wound comparatively clean. In this case they were continued for five days, at which time all induration and redness had disappeared and very little seropurulent discharge was present, and the opening which remained was not larger than a moderate sized lead pencil. The abdomen was now strapped with adhesive plaster and dressed with dry gauze. The patient left the hospital at the end of the third week in good condition. Examination of the scar revealed no evidence that there had been suppuration.

This patient was examined March 15th, and there was no evidence of any exudate in the pelvis or loss of strength of the abdominal wall.

May 29, 1907, I read a paper before the Chicago Medical Society upon this subject, which was published in the Illinois Medical Journal for September, 1907. This paper outlined the treatment of wounds such as described above. My treatment of such suppurative wounds has changed but little since that time, except that I have become more convinced of its value. The special advantages of this treatment over the usual treatment—removal of the sutures, opening of the wound, insertion of drainage, and irrigation—are:

1. Very little injury is done to the wound by the suppuration.
2. The patient is disturbed very little physically or mentally. The treatment is entirely painless and the patient is assured that the suppuration is of very little importance.
3. The time required for the recovery of the patient is much lessened because when the suppuration stops there is very little wound left to heal.

**Remarks.**—The principles underlying this treatment, I be-



lieve, are entirely consistent with the modern ideas of infection and immunity. It is also based upon the results obtained by the treatment of wounds with and without antiseptics, using control wounds for comparisons, which demonstrate that antiseptics injure the tissues more than they do the bacteria, and delay recovery. There is a great advantage in not producing pain or causing the patient to worry, factors which are of much importance in the recovery, and of special value in the prophylaxis of postoperative neurasthenia.

Experience has shown that it is not necessary to remove sutures, as the wound will drain sufficiently through a very small opening if wet dressings are used, so that the discharge will not desiccate or coagulate and obstruct drainage. I have seen efficient drainage from extensive suppuration through the stitch hole of a tension suture.

The special advantages of not removing sutures are that it prevents injury to the wound and protects against hernia, and leaves a small wound for healing after suppuration ceases. The patient vaccinates herself with this treatment and thus hastens immunity. The sutures are removed when they start to cut the tissues. The wounds are not probed, as probing does not modify the treatment, disturbs the patient, and may extend the infection. The wounds are not manipulated. Pressing of the wound endangers dissemination of the infection, produces pain, and accomplishes nothing but harm.

The irrigation of wounds should be of historic importance only. It shocks our sensibilities to frequently observe irrigation of infected wounds. It is impossible to explain how this pernicious treatment can continue with the advance which has been made in surgery, with the knowledge that has been acquired in infections and immunity, and with the research work which has been done relative to the dangers of the use of antiseptics in infected wounds. Aside from the above, antiseptics and irrigations mechanically remove much of the delicate wound repair tissue.

The use of gauze and tubing in suppurating wounds more often obstructs than promotes drainage. It is a common ob-

ervation that considerable drainage often follows removal of rubber tubing or gauze, which shows that it was acting as a cork more than a drain.

The persistence of a sinus means that there is a foreign body or necrotic tissue at the end of the sinus, otherwise the sinus would not be present or would not persist. There is no object in keeping a sinus open, as it will remain open as long as the foreign body or necrotic tissue remains, and it will close spontaneously as soon as these disappear. The treatment of such sinuses is to keep them clean and allow the cause either to absorb or to slough out, as the case may be. If they result from infected catgut they will persist until the catgut disappears. If due to silk or strands of gauze, they will remain until the silk or gauze cuts through the tissues and escapes. If due to necrotic material, they will persist until the necrotic tissue disappears.

The above treatment is employed in all cases of infected abdominal wounds.

## CLINIC OF DR. ROGER T. VAUGHAN

### COOK COUNTY HOSPITAL

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#### HEMATOMA OF THE RIGHT RECTUS MUSCLE

*Summary:* A patient presenting a swelling in the right rectus muscle of sudden onset with severe abdominal pain; diagnosis; treatment; improvement under antiscorbutic management.

THE patient, an English laborer, aged forty-nine, entered the Cook County Hospital March 8, 1918. The examining room diagnosis was "abdominal tumor."

Five days before entering the hospital the patient was suddenly seized with severe pains in the lower abdomen. The attack came on at night, the pain awakening him from sleep. He could not fall asleep again because of the pain. The next morning he took a cathartic on arising. Following the bowel movement the pain was somewhat relieved, but not entirely. Since then it has remained dull and gnawing in character, but is relieved considerably each time he has a bowel movement. The pain does not radiate to the back, shoulders, or genitalia. There have never been any sharp colicky exacerbations. The patient has not vomited, but has felt a little nauseated at times. After each meal since the onset of the pain there has been some feeling of abdominal distress about half an hour after eating. The pain has not varied with his position and has not been worse at night except the first night.

When the pain first set in the patient was sleeping in a room by himself with the door locked. He scouts the possibility of trauma. He claims that he never drinks to excess and has imbibed nothing alcoholic for three weeks. He works as a coal-passer in a boiler-room. The work is hard and exhausting, and has always furnished him with a good appetite until now, practically irrespective of the kind of food. Since his abdominal



pain set in, however, he has eaten very little, chiefly eggs, milk, and tea.

For the past few days the patient has noticed that his urine is more highly colored than usual, but not smoky or bloody. He has had no pain on urination or increased frequency. He urinates once or twice at night.

Because of the pain the patient has not been able to continue his work as fireman since the onset of his present trouble. He denies any previous illness confining him to bed. He admits a chancre eighteen years ago, but no secondaries. He denies Neisserian infection.

**Examination** reveals a well-developed white male. Scalp negative.

Right eye apparently normal. Patient states his vision is O. K. Vision in left eye became poor three years ago and eye is now completely blind. He cannot even perceive light. Ophthalmoscopic examination shows a white, round tumor in the inner and lower quadrant of the vitreous and some detachment of the adjacent retina. The optic disk and the rest of the retina appear normal. There is a distinct iridodonesis. No anterior or posterior lens reflex is present on ophthalmoscopic examination (dislocation of the lens into the vitreous). The left eye does not react to light; the right does. Ears and nose negative.

Pharynx hyperemic (smoker's pharyngitis). The teeth are in poor condition, with much caries and many old snags needing removal. The gums are a little swollen, but not distinctly blue or easily bleeding. The tongue is evidently slightly swollen since the teeth leave imprints on its sides. Tonsils submerged. Neck, heart, and lungs negative.

Abdominal examination reveals a *tender, oval tumor mass in the right lower quadrant*. The skin shows a small area of *purplish discoloration* over center of the swelling. This discoloration does not change when pressure is made. There is no abrasion of the skin. No other palpable masses are present in the abdomen. The liver and spleen are not palpable. Abdominal rigidity is slight if present at all. This swelling can be grasped

by the hand and moved rather freely from side to side when the patient's abdomen is relaxed, and can, to a much less extent, be moved up and down. When the patient lifts his heels from the table, thus contracting his recti muscles, the tumor at once becomes fixed and cannot be moved in any direction. It is, however, almost as definitely palpable as before the rectus muscles were tightened. We must, therefore, conclude that this tumor mass lies inside the right rectus sheath.

Genitalia, nervous system, spine, glands, and skin are negative.

Cystoscopic examination of the bladder was negative. Mucosa normal. Kidneys normal. Ureters normal.

Temperature, 97° F. on admission; pulse, 92; respiration, 20. The patient gives no history of fever or chills during his attack.

Urine: Amber in color; specific gravity 1022; acid in reaction; no albumin or sugar; but a few red blood-cells were seen with the microscope.

The Wassermann test on the blood was negative. White count 9200. Red count 4,100,000. Differential white count showed 65 per cent. neutrophils; 21 small mononuclears; 9 per cent. large mononuclears; 2 per cent. eosinophils; 1 per cent. basophils; 3 per cent. transitionals. Red cells appear normal in contour and staining reaction.

**Comments.**—I was called to see this case as a possible abdominal surgical emergency because of the acuteness of onset, short duration, and rapid development of the tumor, slight abdominal rigidity, anorexia, and nausea. The doctor who admitted him to the hospital was very conservative in his diagnosis of "abdominal tumor." He could not very well call it a case of acute appendicitis or peri-appendical abscess because there was no leukocytosis and no fever.

Examination now reveals clearly that the tumor lies inside the rectus sheath. If we accept the man's statement that it is of five days' duration, it might be either a well-walled-off inflammatory tumor or a collection of blood. Since there is no fever or leukocytosis and no evident source of infection, we must rule out an inflammation and conclude that this is a hematoma.

To further substantiate our diagnosis we see an ecchymosis in the skin over the center of the tumor. Is this central ecchymosis a traumatic affair or is it blood working its way to the surface from below? I see no reason for denying the man's statement that he has suffered no recent trauma. What object could he have in deceiving us? Furthermore, there is no abrasion of the skin to indicate a traumatic origin for this ecchymosis or the rectus hematoma, and the patient also has some blood in the urine as a further indication of a hemorrhagic diathesis. If he had had any systemic infection recently I might suspect that the hemorrhage is the result of Zenker's necrosis of the rectus muscle, such as we not infrequently see during convalescence from typhoid fever and other acute systemic infections; but he gives no such history. Therefore I must presume that he has developed a hemorrhagic diathesis of unknown origin, which because of the presence of deep muscle and fascial hemorrhage and the absence of cutaneous hemorrhages most resembles a mild scurvy. These characteristic deep fascial hemorrhages differentiate scurvy from the other forms of hemorrhagic diathesis. They are most frequent in the leg and thigh. They occur, as you know, in poorly fed men who are doing heavy work and suffering dietary hardships in addition. Most kinds of heavy labor entail muscular strain in the legs. The length and weight of the blood column here reaches its maximum, hence the frequency of scurvy hematomas in the leg muscles. Because of his occupation as a coal shoveler the man probably puts severe stresses on his rectus abdominis muscles. Is that why *his* muscle hemorrhage has occurred here? I think it is a likely explanation.

But we shall not operate on this "acute abdomen." The hematoma will not become infected and absorption of it will go right on. We shall presume that he has scurvy and put him on an antiscorbutic diet. Provided no other hemorrhages develop and rapid absorption of this hemorrhage occurs, he will not need to stay in the hospital, but can continue his treatment at home.

**Subsequent Course.**—During the next three or four days the blood from the hematoma worked more and more to the surface,



and the whole tumor became somewhat greenish and purplish in color. The man was put on a diet of fresh vegetables and fruit, lemon and orange juices. Calcium lactate was administered. After six days' observation in the hospital he was allowed to go home to continue the same dietetic measures there. No further hemorrhagic phenomena developed up to the time he left.

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## CLINIC OF DR. EDWARD LOUIS MOORHEAD

### MERCY HOSPITAL

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## STRICTURE OF THE ESOPHAGUS: DISCUSSION OF THREE CASES

*Summary:* Causes of esophageal stricture—the diagnosis—differentiation of functional from organic obstruction; treatment; the Ssabanajew-Frank gastrostomy.

IN presenting these 3 cases of stricture of the esophagus I want to take up with you briefly the subject of esophageal obstruction.

Obstruction of the esophagus may be produced by causes from within the lumen of the esophagus or its wall, or by causes from without producing pressure upon the esophagus. Internal causes may be divided into, first, those caused by foreign bodies. Portions of food, coin, fish-bones, pins, plates of false teeth, etc., are the substances usually met with. The patient complains that something has lodged in the gullet, causing a feeling of pain and distention, while swallowing is painful or impossible, and respiration may be more or less difficult. Large bodies are frequently impacted at the entrance to the esophagus, and may cause sudden death from dyspnea; if the obstruction is not so great and remains unrelieved, it may give rise to edema of the glottis. Impaction lower down may be followed by ulceration, perforation, and death either from hemorrhage, owing to one of the large vessels being opened, or from suppurative cellulitis.

Inflammation of the mucous membrane may arise from injury (as already mentioned) or from some specific causes, such as tubercle, syphilis, thrush, or diphtheria; but, with the exception of the first of these, the symptoms are vague, consisting merely of pain on swallowing, and rarely attract attention unless the



ulceration is so extensive as to lead to the formation of a cicatricial stricture.

Paralysis of the muscular coat of the pharynx or esophagus is occasionally met with after diphtheria, and may in rare instances be due to alcohol- or lead-poisoning. Dysphagia is always present, but it differs from that which occurs in stricture, in that solids are swallowed more easily than fluids. Sometimes the food collects and is ejected after a time by coughing or vomiting.

Hysteric paralysis is much more common, the patient being convinced either that there is a foreign body in the esophagus, or that there is a stricture (usually after having seen a case), and being unable to will the act of deglutition. It is chiefly met with in young women who present other hysteric symptoms, but it may occur in men. The suddenness and incongruous nature of the symptoms, the history, and a few days' careful watching are sufficient to prevent a mistake. The greatest difficulty is in connection with foreign bodies; a fish-bone perhaps has been actually swallowed and scratched the mucous surface; and the sensation arising from this, and intensified whenever anything passes down, is a sufficient stimulus to keep up the suggestion of dysphagia in the patient's brain. It rarely happens, however, that there is any collection of food above the obstruction; either the patient keeps it in the mouth without attempting to swallow it, or, if it does pass over the larynx, it is immediately ejected again, often with an unnecessary display of energy.

Another condition, somewhat similar to this, is a form of muscular spasm which affects the pharynx rather than the esophagus. It varies from merely a slight stammering of deglutition, such as might arise from simple nervousness, to violent ejection of the contents of the pharynx through the mouth and nose. In neither of these conditions, however, whether paralysis or spasm is the prominent feature, is there marked emaciation or craving for food; the patient is usually fairly well nourished, though always complaining (differing in this respect altogether from those who persistently refuse to take any food), and not

infrequently it is found on making inquiry that the difficulty has already lasted many years off and on, long enough to negative absolutely organic contraction.

Esophageal obstruction may be due to diverticula. A diverticulum is a localized distention of the esophagus with the gradual formation of a sac of greater or less extent, lined by mucous membrane and blind at its distal end.

Diverticula are divided into two groups according to their causation: those arising from pressure from within, pulsion diverticula, and those arising from traction upon the esophagus from without, traction diverticula.

Usually no symptoms are produced until the pouch has attained some size and food is retained in it. As its size increases the pressure of the distended sac tends to keep the normal orifice of the esophagus closed, thus producing dysphagia.

Symptoms are slowly developed; usually a little difficulty in swallowing any food, liquid or solid; a sensation of pressure and discomfort while eating and after. Patient may learn to eat slowly, with the head in a certain position, or to make certain movements while eating, or to press with his finger upon some fixed point in the neck during the act of swallowing. Sometimes the first few mouthfuls are swallowed with difficulty, later the food goes down readily. Sometimes the condition is reversed. Regurgitation and vomiting of small quantities of unchanged food may occur without much effort, or there may be quite violent gagging and retching; in either case relief follows.

Polypoid or other benign growths within the lumen of the esophagus may give rise to obstruction without producing a true narrowing of its caliber. These growths usually occur at the upper end of the esophagus, and grow from the posterior wall occasionally at lower levels. If small, usually no symptoms are produced, but as they increase in size symptoms occur. They occur more frequently in men than women, and usually develop during middle age or later in life. As a rule they are pedunculated, and as they hang down in the esophagus swallowing movements tend to lengthen the tumor by traction. The symptoms are mod-

erate dysphagia, a sensation of the presence of a foreign body, sometimes a palpable, movable tumor in the neck. If they are coughed up into the pharynx, they may overlies the larynx and cause sudden choking and even asphyxia. Compression does not cause regurgitation of food into the pharynx, differing in this from diverticula. They may cause vomiting or a desire to vomit after eating. Ordinarily the diagnosis is quite simple, especially when the location of the tumor is high up, by palpation with the forefinger, the use of the laryngoscopic mirror or the esophagoscope.

Among the external causes producing esophageal obstruction may be mentioned inflammatory swellings, enlarged lymphatic glands, enlarged thyroid, aneurysm of the arch of the aorta, and tumors.

Organic stricture of the esophagus may be congenital or acquired. The former is exceedingly rare; the latter, which is very common, may be simple or malignant.

Simple stricture arises nearly always from the swallowing of corrosive fluids. The mucous membrane sloughs and cicatricial contraction follows. Sometimes almost the whole length is obliterated in this way, but the effect is always greatest at the commencement. In rare instances it may arise from some form of specific inflammation, such as tubercle or syphilis. At the cardiac orifice it may arise from the healing and contraction of a gastric ulcer.

Malignant stricture is usually epitheliomatous in type, and occurs during middle life and later. It is situated either at the junction of the pharynx and esophagus, behind the cricoid cartilage, or in the middle of the tube, where it is crossed by the left bronchus, or at the cardiac orifice of the stomach. The growth involves the whole circumference of the tube, and sooner or later may ulcerate and perforate the trachea, pleural cavity, or one of the large vessels. Secondary deposits occur in the lymphatic glands, either of the neck or posterior mediastinum, visceral complications being uncommon.

**Symptoms.**—The most prominent symptom of all strictures is difficulty in swallowing food. If the obstruction occurs sud-



denly, there may be total inability to swallow. If the obstruction is high up, the effort to swallow is followed by immediate regurgitation through the nose and mouth. If lower down, an interval may elapse before regurgitation occurs. If the obstruction is slowly formed, the symptoms gradually increase in severity. Cicatricial stricture following the ingestion of caustics are at first of an acute inflammatory character, with symptoms of more or less obstruction, and all attempts to swallow attended by severe pain. As the acute inflammation subsides the symptoms of obstruction may entirely pass away, to be followed by gradually increasing difficulty in swallowing, which may not appear for some time, and is not attended by pain. Fluids and soft foods are most easily swallowed, and these patients learn to chew their food thoroughly, to eat slowly, and to swallow small quantities at a time.

Dilatation above the stricture often occurs, and food accumulates in the dilated part, causing frequent regurgitation of food and mucus. As the obstruction increases the nutrition begins to suffer, and a severe grade of emaciation and anemia is finally reached, ending in death from starvation unless relief is obtained.

The symptoms of malignant stricture are similar to those of benign stricture, but, in addition, it occurs in advanced life, rarely before the fortieth year; most cases after the fiftieth year. Men are more often affected than women, the proportion being 4 to 1. The physiologic narrowings are favorite sites. In most cases the tumor originates in the esophagus, occasionally it is an extension from cancer of surrounding structures. The tumor may be small or large; a portion of the wall only may be the seat of the disease in the early stages, but usually the entire circumference of the esophagus is involved.

Secondary tumors often form in the lymph-nodes at the root of the neck and in the mediastinum. When the upper part of the esophagus is affected, the growth may extend to the back of the larynx and cause hoarseness and even aphonia. Occasionally the pneumogastric nerves may be involved in the mass, leading to interference with the action of the heart, while im-

plication of the recurrent laryngeal nerve causes constant cough and uni- or bilateral paralysis of the larynx.

The diagnosis of esophageal stricture can be made by the administration of a bismuth meal and radiography, especially by the use of the fluoroscope, or by examining the condition of the tube with an esophageal bougie. Great care must be exercised in the use of the bougie, as much damage may be done with it, especially in suspected malignant cases, where perforation of the wall may occur, giving rise to a fatal cellulitis. A malignant stricture usually feels rough and is painful, while a simple stricture is smooth, regular, and almost painless. It is not easy to distinguish malignant from simple stricture by the bougie alone. The history of the case, general condition of the patient, radiography, and the use of the esophagoscope will aid materially in making a differential diagnosis.

Treatment of cicatricial stricture is best carried out by dilatation with bougies of gradually increasing size. An interval of a few days should elapse between the attempts at dilatation, and during this period the patient should be given as much food as he can take, in the form of broths, eggs, minced meat, etc., or, if necessary, rectal feeding may be resorted to. If it is impossible to dilate, a fine rubber tube can usually be passed through the stricture by the assistance of the esophagoscope, and is maintained there for a time. The upper end is drawn out of the mouth and fixed. Feeding is rendered more easy, and the presence of the tube for a time gradually determines dilatation of the stricture. When the stricture is at the pharyngeal extremity, it may be possible to divide and subsequently dilate the stricture by the aid of the esophagoscope. If the stricture is located at the cardiac orifice of the stomach, the fingers may be used to dilate the stricture, after opening the stomach, as in gastrotomy. Where these measures have failed, the stomach may be opened and division of the stricture by the string saw attempted. The patient is made to swallow one end of a piece of string or a small shot may be clamped on a piece of silk, and allowed to find its way into the stomach. When the stomach is opened the free end is secured, and by this means a coarse

silk thread is carried through the obstruction; by up-and-down sawing movements the stricture can be divided, thus enabling

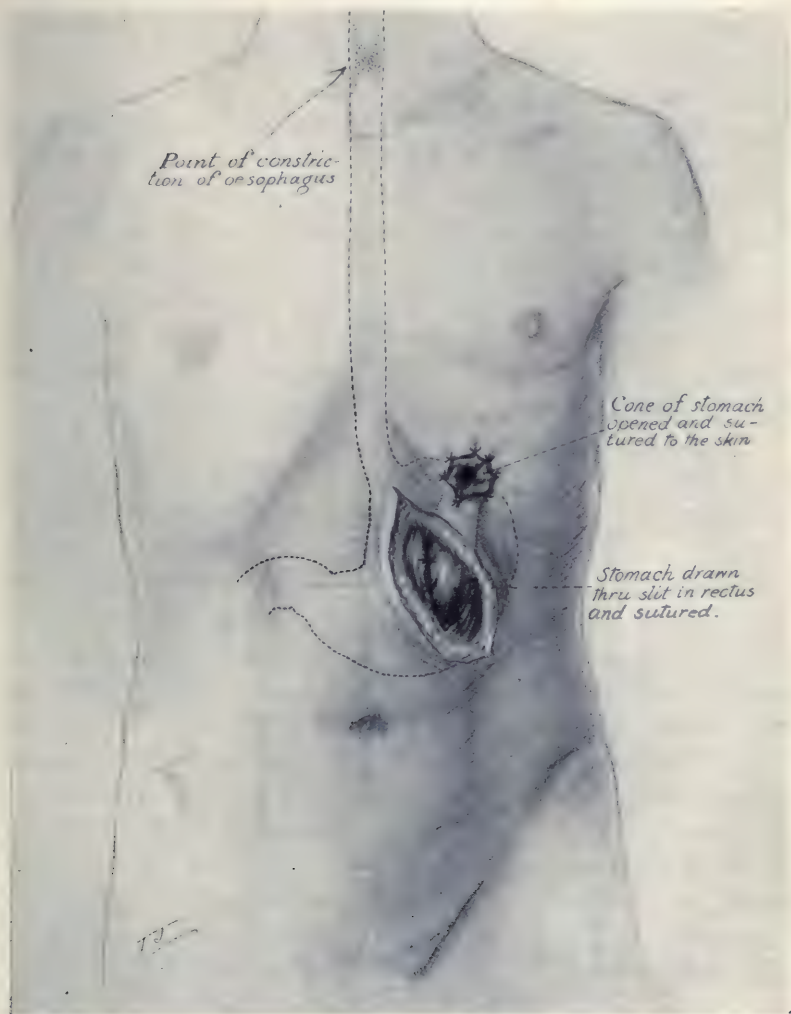


Fig. 209.—Modified Ssabanajew-Frank gastrostomy.

the surgeon to introduce bougies. Gastrostomy is the final recourse. Occasionally when the esophagus has by this means been kept at rest for some time, the stricture will yield, and dila-



tation by bougies becomes practicable, and the gastrostomy may be allowed to close (Fig. 209).

Treatment of malignant stricture is quite unsatisfactory. Dilatation by bougies should not be done for fear of increasing the ulceration, causing severe hemorrhage, or perforating the walls of the esophagus. In some cases dilatation may be done carefully to enable a tube to pass through the stricture for feeding purposes. Gastrostomy is likely to be required sooner or later, and if done early may prove of great benefit to the patient.

**Prognosis.**—In cicatricial stricture the prognosis depends upon the general condition of the patient and the degree to which the stricture can be readily dilated. In malignant stricture the duration of the disease is from one to two years, the patient dying as a result of the emaciation, anemic cachexia, starvation, or earlier from perforation of the trachea, pleura, mediastinum, or from hemorrhage.

**CASE I.**—Mr. F. M., aged forty-four, single, German. Occupation, brass finisher. Patient states that his sickness began four and a half months ago, with pain in the chest, located under the manubrium sterni. Pain was dull and aching in character and present only at times, usually in the morning on awakening, but gradually wore off during the day. It was not influenced, brought on, or made worse by anything he knows of; not increased by deep breathing or coughing. Pain has increased lately. Hoarseness has been present from the beginning. Onset sudden, awoke one morning and found that he was very hoarse. Talking not painful, but difficult. Difficulty in swallowing came on gradually. Unable to swallow any solid food, all attempts being followed by regurgitation. Liquids go through if he drinks very slowly. Unable to work for the past six weeks on account of weakness, due principally to his inability to take sufficient nourishment. He says that he has lost 25 pounds in weight since his illness began.

General history negative—no headaches; sleeps fairly well; no visual disturbances. Cough has been present for the last month. Brings up large amounts of rather thin yellowish sputum, which has never been brown or contained blood. Cough-

ing and expectoration have no influence upon the substernal pain. No dyspnea or swelling of the feet. Has had night-sweats for the past week. Becomes cold and then seems to have a fever. Toward morning he says he sweats for about an hour and then falls asleep. Appetite good, but unable to eat.

Past history: No special illness. Venereal history denied. Uses tobacco and drinks 4 glasses of beer a day. Father died at sixty-five years of some heart trouble. Mother alive and well. Three brothers and three sisters all living and well.

*Physical Examination.*—Rather thin middle-aged man; cheeks sunken; pale, but does not appear acutely ill. Pulse 62, temperature 98° F., respirations 20. Blood-pressure, systolic 110, diastolic 70. Pulse-pressure 40.

Head, scalp, and nose negative; ears cyanotic.

Eyes—pupils dilated, equal, react to light and accommodation. Eyes rather prominent. Ocular movements normal.

Mouth—lips pale and somewhat cyanotic. Tongue small and clean. Teeth, many missing. Moderate pyorrhœa alveolaris.

Neck—cervical veins moderately dilated, but equally so. No cervical adenopathy. No enlargement of thyroid. No tracheal tug. No rigidity.

Chest is symmetric. No visible pulsations. Expansion good and equal. No presternal dulness. Lúngs are resonant throughout. No alteration in breath or transmitted voice sounds. No adventitious sounds. Heart borders within normal limits. Tones normal; no murmurs.

Abdomen: No distention or rigidity. Liver and spleen not palpable. No palpable tumor masses or tender areas. Genitalia negative.

Extremities cold. Finger-tips cyanotic. No edema or paralysis.

Reflexes: Pupillary, biceps, abdominal, and patellar present on both sides.

Blood: Hemoglobin, 100 per cent.; white blood-cells, 11,200. Wassermann negative.

Urinalysis—twenty-four-hour specimen. Quantity 800 c.c.,

specific gravity, 1028; alkaline; no albumin; no sugar; few white blood-cells and bacteria.

Radiographic examination shows esophageal obstruction at level of sternal notch, apparently due to malignant stricture.

This patient was in the hospital about three weeks ago, at which time he was given a braided silk thread to swallow. After the thread was well anchored, dilatation was attempted with olive-tip dilators. This was not very successful, as slight hemorrhage occurred each time.

You will please notice the efforts the patient makes when he tries to drink water. Unless he does it very slowly it will at once bring on coughing and regurgitation. He is unable to swallow any solid food.

There is no question as to the diagnosis in this case, neither is there as to the proper treatment. The patient was advised to submit to a gastrostomy before, but he has delayed it, and now returns for operation. The operation which will be done in this case will be the same as that done in the third case, which I shall show you this morning.

CASE II.—Mr. F. Z., aged forty-eight years, married. Slavic. Occupation, metal polisher.

This patient gives a history of having difficulty in swallowing for the past six months. Previous to this time, as far as can be learned, his health was good. He has lost considerable weight. Says he is hungry, but unable to swallow any food. He locates with his finger the point at which all food or liquid stops, and through the interpreter asks that I push something through it.

Physical examination of the patient is negative, except for the emaciation, as a result of lack of nourishment. Wassermann negative. We will have him try to drink some water and you can readily see the difficulty he has, and his inability to swallow, the water promptly regurgitating through the mouth and nose. He complains of considerable pain at the point of stricture, and, upon examination of the neck, there is found some thickening about the lower border of the larynx. We have been unable to pass anything in the line of bougies through the stricture.

Radiographic examination shows a stricture of the esophagus



about 8 inches from the incisor teeth. When this patient first came to the hospital I advised a gastrostomy, but he refused. He returned to his home, and now comes back to ask for some relief outside of operation. There is none, and in his case operation will do no good, as he has waited too long. The degree of emaciation is so great, the patient has practically starved, that the prognosis in his case is very bad. If anything is to be done for these cases it must be done at a time when there is some chance of keeping up their nutrition. Two years is perhaps the limit of time for them under the most favorable conditions, whether operated or not. No one has been able to convince this man what his trouble is. He has his own idea of it, and while I tried at our first meeting through the interpreter to convince him of the gravity of his case, it was of no avail. Probably if consent had been obtained six months ago for operation his condition might have been better today and his life prolonged for a little while, with some degree of comfort.

CASE III.—Mr. D., aged fifty-two years, single, American. Laborer. This patient gives practically the same history as the two preceding cases. There is not much difference in the story they tell you of how their trouble began and of its progress up to the time when they were unable to swallow any food. His illness began about two months previous to his operation, and he is shown to you now (thirteen months following the operation) that you may see the results.

The esophageal stricture in this case is in the same location as the one shown by the skiagraph (Case II). Unfortunately, the plates in this case have been lost or mislaid and cannot be found at present.

The patient looks fairly well, says he feels well, and is able to go about and do some light work. Up to the present he has held his weight fairly well; how long it will continue we cannot say. He takes a liberal amount of nourishment through the gastrostomy tube and takes very good care of himself.

There have been several methods devised for performing gastrostomy. In all of them the object aimed at is the establishment of a fistula leading into the stomach, through which a

tube can be passed and food introduced into the stomach, and the avoidance of leakage of the fistula, with consequent irritation of the skin of the abdominal wall by the gastric juice. Two methods of attaining this result have been attempted: the formation of a valve from the stomach wall, as in the Stamm, Kader, and Witzel methods; the use of a portion of the stomach wall pulled out of the abdominal cavity between the muscular layers of the abdominal wall, in an attempt to obtain a sphincteric action of the muscle, as in the Jaboulay and Hartmann or the Frank, Ssabanajew-Albert methods.

In this case the Ssabanajew-Frank method was used. A skin incision is made 3 inches long parallel to the left costal margin and 1 inch below it. Divide the left rectus muscle and sheath vertically and pull out a cone of the stomach from as near the cardia as possible. See that the area pulled out is sufficiently long, without tension, for the following procedure: Insert a traction suture in the apex of the stomach cone. Undermine the skin to a point above the costal margin. Make a small incision over this point and pull the apex of the cone of the stomach through this opening without tension. Suture the stomach wall of the base of the cone to the parietal peritoneum and posterior rectus sheath. Suture the rectus muscle and anterior sheath from below upward, leaving the upper part of the stomach cone passing between the upper separated rectus fibers above for sphincteric action. Close the skin of the first wound. Make a small opening in the apex of the stomach cone and suture the edges of the opening to the skin.

Kocher modified this method by retracting the rectus muscle outward instead of splitting its fibers, and then using the Witzel method of inserting the catheter, instead of pulling out the apex of the cone of the stomach wall above.

The objection to the method used in this case is the amount of stomach wall employed, it being impracticable in a small, contracted stomach.

## GONORRHEAL SPUR ON THE OS CALCIS

*Summary:* A patient complaining of painful heel, with a history of specific urethritis twenty-nine years ago; diagnosis; treatment by removal of spur.

MR. J. M., aged sixty-four years, married. Scotch. Occupation, machinist. Gives the following history: About three years ago he states that every morning when he would stand upon his left foot there would be considerable pain in the left heel. The pain was increased upon walking, but did not bother him at night while lying down. This condition persisted for about one year, during which time he resorted to various methods of treatment, ointments, massage, etc. About five months ago there was a return of his former symptoms, and for the past three months the pain has increased in severity, so much so that at the present time he is unable to walk any distance, or stand on the foot for any great length of time.

*Past History.*—Usual diseases of childhood.

*Venereal History.*—Gonorrhea twenty-nine years ago. Syphilis denied.

*Family History.*—Father died of a fever, the nature of which he does not know, aged forty-three. Mother died at seventy-three. He has four brothers and two sisters living and well.

*Physical Examination.*—Reveals a well-nourished and healthy looking man, not apparently acutely ill. Pulse, 80; temperature, 99; respirations, 18. Blood-pressure, systolic 145, diastolic 100. Pulse pressure, 45.

*Urinalysis.*—Specific gravity 1020; reaction, alkaline; no albumin, sugar, or casts.

*Regional Examination.*—Head and scalp—scars over left temporal region, otherwise negative.

Ears—left ear, complete deafness; right ear, negative. Large amount of wax.

Eyes—no ptosis or nystagmus. Conjunctiva and sclera not injected. Pupils regular and equal and react to light and accommodation.



Nose—negative.

Mouth—teeth fairly good; tongue clear; tonsils present.

Neck—palpable submaxillary glands; no abnormalities.

Chest and thorax—inspection shows a large amount of hair; well developed. Palpation, percussion, and auscultation negative. Heart—borders normal; tones clear; no murmurs.

Abdomen—pendulous, large amount of fat; scar from hernia operation on left side.



Fig. 210.—x-Ray, showing spur on the os calcis.

Extremities—left leg, negative. Right leg, evidence of varicose veins; small painful area over heel of left foot. Pain increased upon standing on foot or walking.

Genitalia—negative.

Reflexes—negative.

Adenopathy—palpable submaxillary glands; inguinal glands slightly palpable.

The x-ray plate of left foot shows a spur of bone on the inferior and inner aspect of the os calcis, about  $\frac{3}{8}$  inch long with a base of about  $\frac{1}{2}$  inch (Fig. 210).

The diagnosis in this case is a gonorrheal spur resulting from an irritative periostitis.

Gonorrheal periostitis is fairly frequent in certain localities, especially under the calcaneus, in which situation spurs result from the inflammation. These bony spurs should be chiseled away. A peculiar condition of sensitive feet, found occasionally in patients with chronic gonorrhea, is probably due to a mild

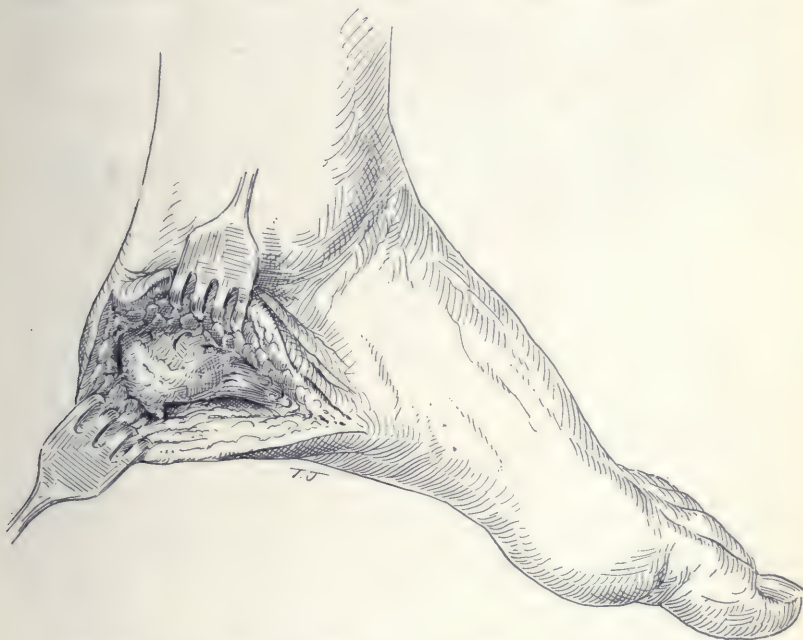


Fig. 211.—Os calcis exposed through slightly curved horizontal incision, showing spur on bone, about to be removed with a chisel, which has caused the symptoms.

degree of periostitis. These patients walk as if they were treading on eggs.

*Operation.*—These patients should receive special preparation before operation. In this case the foot has been subjected to a prolonged bath and the application of a sterile dressing daily for several days. It is rather difficult to sterilize the field of operation in these cases. Regarding the incision, we can make either the median incision over the Achilles tendon and

into the sole, as described by Landerer, or a slightly curved horizontal incision on the inner side of the heel. The objection to the median incision is that the scar lies in part on the plantar surface and may prejudice walking. In this case I will make the horizontal incision about  $2\frac{1}{2}$  inches in length. Care must be exercised to avoid injury to the posterior vessels and nerves. The flap of the heel is retracted downward and the spur of bone on the os calcis is readily felt with the finger. With the chisel on the flat, by a few strokes with the hammer the spur is detached from the os calcis, and it corresponds in shape and size with the *x*-ray plate. The incision is closed with silkworm-gut sutures and the usual dressing applied (Fig. 211).

*Note.*—This patient was seen two months following operation. He has had no further pain or discomfort in the heel.



## CLINIC OF DR. CHARLES E. HUMISTON

WEST SUBURBAN HOSPITAL

### DEMONSTRATION OF FIVE CASES

*Summary: Case I.*—Osteomyelitis of both tibiae, with destruction of the upper half of each bone; present condition after two years.

*Case II.*—Indirect gangrene of both feet from thrombosis of the popliteal arteries. Amputation of both thighs. Present condition after one and a half years.

*Case III.*—Ulcer of the stomach—pyloric obstruction. Gastro-enterostomy—symptomatic cure—recurrence of ulcer symptoms after five months—anastomotic opening patent.

*Case IV.*—Fracture of the surgical neck of the humerus in a child of five years—open treatment—technic.

*Case V.*—Hour-glass stomach—adhesion to abdominal wall—technic of operation.

*April 5, 1919.*

CASE I.—F. W., aged ten, the younger of two children, came under my observation two years ago.

The family history reveals the patient to be the posthumous child of a father dead at forty-two of paresis. The mother and an older brother are living and well.

The onset of the trouble which led to the present condition began in January, 1917, with a sore throat, soon followed by severe pains in the legs, which in a few days showed "red spots" on both shins just above the shoe tops. These "red spots" never "came to a head." There was marked swelling, pain, and tenderness of both legs to above the knees. The condition is said to have been regarded as "rheumatism" and to have received medical treatment for six weeks, at the end of which time a consultation led to a correct diagnosis.

I first saw the patient on his admission to the West Suburban Hospital March 21, 1917, eight weeks after the beginning of his illness. He presented the clinical picture of extreme



Fig. 212.—Case I.  $x$ -Ray examination of right and left before operation by Dr. Edward S. Blaine. Right leg: The upper half of the shaft of the tibia is involved in extensive osteomyelitis. There is sequestrum and involucrum formation. The process has crossed the epiphyseal line and involves the entire epiphysis. The fibula shows no changes whatever; the process has not involved this bone. The lower half of the tibia appears approximately normal. No changes appear to involve the femur except an atrophy. The above description fits almost identically the condition found in the left leg. The extent of involvement is approximately the same.

sepsis and emaciation. Both legs were swollen and there was subluxation of both knee-joints. Both legs showed fluctuation from the knees to below their middle. Pus was oozing from a puncture on the anterior aspect of each leg. x-Ray examination showed almost complete destruction of the upper half of each tibia, including the epiphysis, with both knee-joints invaded (Fig. 212).

Wassermann test by Dr. Frances Chapman proved negative.

Operation was done under gas anesthesia March 26, 1917, both legs being dealt with alike. Incision over the anterior upper aspect of the tibia resulted in a gush of pus, bone shreds, and débris that left practically nothing but *cavity* where had been upper tibia. Palpation of the walls of the cavity disclosed thin irregular remains, or deposits, of bony tissue. The condyles of the femur were visible and bare. Stuffing the cavities with gauze and placing the lower limbs in molded posterior plaster-of-Paris splints, the patient was put to bed.

Slow convalescence followed. The walls of the tibial cavities were prevented from falling together by a scaffolding of gauze. The pus discharge rapidly diminished and the x-ray showed a beginning growth of new bone. The patient left the hospital May 19, 1917, with both wounds open (Fig. 213).

He returned for a second operation October 25, 1917, when I resected the left knee. A thin shaving of worm-eaten bone was removed from the lower extremity of the femur and a somewhat thicker slice taken off the upper end of the renewed tibia. This new bone was soft and porous. The patella was excised. Chromic catgut sutures were used to maintain bony approximation. The wound was closed without drainage, as this limb was no longer septic. A posterior molded plaster-of-Paris splint was applied to secure immobilization. Clean union followed. Nothing was done with the right knee, which showed some degree of motion, but, like the left one, was dislocated backward.

At present there is firm bony ankylosis of the left knee. The boy can bear his weight on either limb, but better on the left one, which is 2 inches shorter than the right. He can walk without cane or crutches, goes to school, and is growing rapidly.



The dislocated right knee is a pseudarthrosis with nearly 90 degrees of motion. The mother is unwilling that any further



Fig. 213.—Case I. x-Ray examination of both legs three months after operation. There is definite evidence of beginning bone regeneration. The condition is apparently good. Only one leg is pictured here, as the other was similar to this.

surgery be undertaken, and for the present I am willing that she shall have her way (Figs. 214 and 215).



Fig. 214.—Case I. x-Ray examination of left leg two years after operation. Left leg: Evidence of extensive old practically healed osteomyelitis involving the upper half of the shaft of the tibia and the lower epiphysis of the femur with firm bony ankylosis. There has been considerable regeneration of bone, but there is a large foramen in the upper portion of the shaft of the tibia from failure of complete regeneration. The distal half of the shaft of the tibia shows considerable atrophy. The fibula shows no involvement of its shaft and but slight involvement of its upper epiphysis. The fibula is dislocated proximally and medially. The patella is entirely wanting.

This case well illustrates a child's ability to grow new bone. The tragedy of these legs is an eloquent appeal against the all too common diagnosis of "*rheumatism*."



Fig. 215.—Case I. Right leg: The changes in the upper part of the shaft of the tibia are about the same as in the left. The upper epiphysis of this bone is not so greatly involved. The lower epiphysis of the femur on this side with its joint surface is practically normal in outline. There is no bony ankylosis as in the other knee. In the healing process the upper end of the tibia became displaced backward and tipped forward, making a marked bony deformity. The fibula on this side is also dislocated in medial direction. The patella on this side remains intact.

CASE II.—J. F. J., aged seventy, was admitted to the hospital in July, 1917, with the following history:

For the past two or three years the right foot got cold easily



—the left one was normal in this respect. There had been no accident or injury, and aside from typhoid fever when twenty years of age, no previous illness. Venereal disease was denied. He was married at twenty-two, and 6 of his 7 children are alive and well.

Ten days before entering the hospital the patient was seized with sudden stinging pain in the calf of the right leg. This occurred while walking along the street. Three or four days later the toes turned black. The foot became cold and gradually changed in color. There was no pain.

On July 7, 1917, amputation of the lower third of the right leg was done. The patient would not consent to a higher amputation—in fact, was unwilling to have any amputation, but at length was persuaded to submit to having the “dead part” removed. The gangrene did not extend above the ankle and no good line of demarcation had formed. The stump was anemic and the flaps sloughed. After the lapse of five weeks the patient was ready to consent to an amputation “anywhere” that would stop the offensive process.

On August 24, 1917, amputation of the right thigh was done in the lower third. The popliteal artery was thrombosed and, though I ligated it, ligation was not really necessary. The collateral circulation was fairly good, however, and this time a good result was obtained.

A few weeks after leaving the hospital the patient telephoned me that his other foot had “gone wrong.” Investigation disclosed beginning gangrene. This time the patient insisted on a thigh amputation, and accordingly on November 7, 1917, I amputated the left thigh well above the knee, and again found a thrombosed and solid popliteal artery. Healing by first intention followed.

It is now about seventeen months since the last amputation. The patient has regained robust health. He now weighs more without his legs than formerly with them. His eye is bright and his voice equal to that of an auctioneer's. His heart and arteries are about what they should be at seventy. There is no sugar in the urine and never has been. An albuminuria present

two years ago has disappeared. All three amputations were done under gas anesthesia.

This case is shown mainly to illustrate the futility of amputation below the knee in gangrene of the foot if the patient be old and the gangrene does not soon show a well-defined line of demarcation; 3 or 4 inches of healthy looking skin is not sufficient to guarantee vitality in the stump. If the deeper tissues are ischemic—go higher. My second amputation should have been done under the first anesthetic.

CASE III.—Mrs. C. B., aged thirty-eight, entered the hospital April 1, 1919, with a history of having vomited blood for the previous two weeks. She complains of localized pain and tenderness in the epigastrium. The pain is greatly aggravated upon taking food. The amount vomited is not great at any one time nor in the aggregate.

The previous history shows the patient to have been a "stomach case" for several years. Two years ago she was a patient in this hospital, at which time I removed an acutely inflamed appendix. She was back in the hospital in October, 1918, when I did a gastro-enterostomy for a pyloric stenosis due to ulcer. Following this operation she was very well until two weeks ago, when the present illness began.

Investigation reveals that the patient had so regained confidence in her digestive ability that she had decided that there was no longer any necessity for observing any restrictions as to the character or the quantity of food to be eaten at any one time. The onset of the present trouble seems to have had a definite beginning after a round of feasting when salads and other chemical irritants were indulged in freely.

General physical examination is negative except for a point of tenderness in the epigastric region an inch to the right of the midline. The state of nutrition is good, plus. The ruddy complexion and the rotund figure bespeak overnourishment rather than the opposite.

x-Ray examination discloses prompt evacuation of the stomach contents into the intestine through the artificial junction made five months ago between the stomach and the upper jejunum.

There is evidently good drainage of the stomach and no obstruction as a reason for gastric spasm. It does not appear



Fig. 216.—Case III. Gastro-enterostomy opening patent and functioning. The contents of the stomach will empty through this opening much more rapidly than if there were a normal functioning pylorus. View taken within five minutes after the administration of 400 c.c. of barium mixture shows that over half of the same has left the stomach. No evidence of ulceration at site of gastro-enterostomy opening. The pyloric end of the stomach and posterior portion of the antrum seem disturbed by adhesions. The cap of the duodenum does not fill.

that the pyloric function has been restored (Fig. 216). Either the pylorus is still obstructed or the gastrojejunostomy offers such easy egress for the stomach contents that the pyloric gate-



way is unnecessary. That is extremely improbable, however, as the artificial exit from the stomach is the one to close when there is a patent pylorus. The symptoms point rather conclusively to peptic ulcer, either a persistence of the ulcer found five months ago and which appeared to have healed, or possibly to another and later ulcer. Internists tell us that gastric ulcer is a medical disease which may become surgical. This case now reverts to a medical phase, and I have asked Dr. Ellis K. Kerr to outline a course of medical treatment. The patient will receive the following diet:

Milk,  $1\frac{1}{2}$  ounces; cream,  $\frac{1}{2}$  ounce, every hour from 7 A. M. to 7 P. M. As an alkali she will be given a powder consisting of 10 grains each of sodium bicarbonate and calcined magnesia and 5 grains of bismuth subnitrate, one-half hour after food.

The milk and cream mixture will be increased after a few days, and egg and cereal will be added gradually.

The withdrawal of irritating foods together with the good drainage of the stomach, which is evident in this case, should yield favorable results. However, if we meet disappointment with this line of treatment, pylorotomy will be done.

CASE IV.—A. D., aged five, referred by Dr. A. R. McDonald, was admitted to the hospital with the following history: A few days previously she fell off a low porch and sustained a fracture of the surgical neck of the right humerus (Fig. 217). A Scudder dressing, consisting of a shoulder cap, axillary pad, and a sling, which was subsequently reinforced by a weight of 3 pounds, failed to secure good apposition. An attempt at reduction under anesthesia and dressing with Middeldorp's triangle likewise failed to hold the fragments in proper position. Accordingly, an open operation was decided upon, which we shall now proceed to do. The operation has been delayed five or six days because the child was suffering from an acute cold. It is now two weeks since the fracture occurred.

Incision along the anterior border of the deltoid affords the best approach. Immediately a large vein, the cephalic, comes into view. I am deepening the incision, using the edge of the knife with caution, as the many important nerves and vessels

of this region must be safeguarded. Using the prominence caused by the displaced upper extremity of the lower fragment as an objective, the bone is uncovered without much difficulty. Flexing the arm at the false point of motion, thus causing the upper end of the lower fragment to protrude, I am enabled to



Fig. 217.—Case IV. Fracture of the surgical neck of the right humerus with internal and upward displacement of the lower fragment, making an overriding of more than an inch.

uncover the upper fragment which lies deeply in the wound, and is freed with some difficulty, as the fracture is, in reality, nearer the tuberosities than the *x*-ray makes it appear to be. There is an overriding of  $1\frac{1}{2}$  inches.

The pectoralis major, teres major, latissimus dorsi, and coracobrachialis aided by the biceps and the triceps are drawing

the lower fragment forcibly upward and inward, while the supraspinatus, infraspinatus, and teres minor are busily engaged in rotating and pulling the upper fragment upward, outward, and backward. These opposing forces must now be dealt with.

By grasping the upper fragment with forceps, being careful not to crush the little bit of shaft remaining, which is already somewhat comminuted, and manipulating the lower fragment as part of the whole limb below the point of fracture, at the same time making judicious use of this wooden-handled screw-driver as a lever, we are enabled to bring the fragments into fairly good anatomic position. It is to be observed that it is necessary to rotate the lower fragment outward in order to fit the irregular projections of the one fragment into their corresponding depressions of the other. Having thus secured reduction, any tendency to redislocation of the fragments is resisted by the irregular dovetailing at the line of fracture.

In many cases restoring the fragments to accurate and correct anatomic relationship with each other, in other words, *open reduction*, is the only open treatment required. In this case, however, I think something more should be done, as the line of fracture is not sufficiently irregular to prevent a recurrence of the displacement if a little injudicious force should happen to be applied, and we must bear in mind that this patient is little more than a baby and will forget this arm when it no longer causes pain. Furthermore, the lower end of the upper fragment is somewhat comminuted and some of the fragments are now missing, so that the two fractured ends do not fit as well as is the case many times. The surface on the upper fragment is larger than that on the lower. I am able to get good contact, but not perfect alignment.

Drilling each fragment and tying them together with kangaroo tendon seems to promise enough support to preserve reduction here; and this procedure will less likely require any subsequent operative interference. The kangaroo tendon will prevent rotation of one fragment without the other; and it will last as long as any artificial support is likely to be needed.

As no important structures have been divided in this inci-



sion, a closure of the skin completes the operation. A wedge-shaped pad in the axilla with its base downward permits fixing the arm to the chest, while a shoulder cap avoids the danger of direct injury and also aids in immobilizing the shoulder. Passive movements will be begun after two weeks and followed up with increasing vigor and frequency, for, after all, the function



Fig. 218.—Case IV. Fracture of the surgical neck of the right humerus. Good though not perfect approximation of the two fractured surfaces. Evidence of callus formation is shown all about the point of bony contact. x-Ray plate made ten days after operation.

of the shoulder-joint is of prime importance in this class of fractures (Fig. 218).

CASE V.—Mrs. M. P., aged forty, entered the hospital in April, 1919, suffering from persistent vomiting.

The family history shows father, mother, five brothers, and two sisters living and well.

The previous history is as follows: She had some severe abdominal trouble when about fifteen years of age, which was called "inflammation of the bowels." She was married at twenty-nine; no pregnancy. In 1916 she had a hysterectomy for fibroid tumor of the uterus. At this time extensive fibrous intestinal adhesions were noted. The adhesions were thought to be from an old tuberculous peritonitis. One year ago the patient was again in the hospital for intestinal obstruction, at which time the lower half of the abdomen exhibited a mass of interintestinal adhesions. Many bands of adhesions were liberated, and following this operation the patient, as she says, was "doing pretty well."

In October, 1918, the patient suffered an attack of influenza which kept her in bed for six or eight weeks. As she began to recover a little strength following this illness, stomach symptoms began to assert themselves. Vomiting became more frequent until recently, when practically nothing is retained by the stomach. The vomiting occurs immediately upon taking food. There is much mucus, but no blood, and the condition is not painful. The patient is not constipated, but she is hungry all the time and her state of nutrition is at a very low point.

x-Ray examination of the stomach on December 30, 1917, previous to the attack of intestinal obstruction, was practically negative—no six-hour residue; no evidence of ulcer or other lesion.

x-Ray examination now shows an hour-glass stomach. The lumen of the stomach at the point of constriction is almost obliterated. The barium meal given at the first examination is, after twenty-four hours, mostly retained in the cardiac end. It is evident that the only nourishment which this patient has been getting recently is the little bit of thin liquid that would seep through this constriction, which is to the pyloric side of the middle of the stomach (Fig. 219).

Rectal feeding has been carried out for the last three days. This feeding has consisted of water, sodium bicarbonate, and glucose—the main thing is the water. While the patient is little more than a skeleton, still she is able to walk.

The patient is about ready for the operation to begin. She has had a small dose of atropin on account of an excess of mucus, but no morphin. I am making a median incision from the ensi-



Fig. 219.—Case V. Hour-glass stomach; note marked constriction just distal to the middle of the stomach.

form downward. What this operation will consist of must be determined as we proceed. I cannot incise the peritoneum in the usual manner, as there are firm adhesions beneath, so firm,



in fact, that the peritoneum is torn away from the abdominal wall and remains adherent to the viscera. At the lower end of the incision I have now succeeded in gaining entrance to the peritoneal cavity. There is adhesion of the stomach to the abdominal wall, so firm, indeed, that to get a free opening I shall



Fig. 220.—Case V. At operation; note wide constricted zone in stomach, confirming deductions made from the x-ray analysis.

have to resect some of this peritoneal and properitoneal tissue and permit it to remain attached to the stomach (Fig. 220). There is such a conglomeration of adhesions among the intestines and omentum, to the abdominal wall, and between the different loops of bowel that a good exposure cannot be had. The stomach seems shriveled and leathery as if it had been

soaked in a formalin solution. The constricted portion is flat and irregular and certainly longer than it appears in the *x*-ray plate. At one place in the isthmus between the two extremities there is a thickened region which perhaps is the scar of a healed ulcer. A strong band of adhesions stretches from the margin of the liver at the region of the gall-bladder to the transverse colon just to the left of the midline. In endeavoring to separate this I have inadvertently torn the edge of the liver, which for some strange reason oozes only slightly. A suture ligature easily placed about this torn part effectually takes care of it.

To resect this stomach would mean to remove more than half of it, and as there seems to be good drainage of the pyloric pouch, a gastrojejunostomy at the cardiac portion seems indicated.

The transverse colon cannot be lifted up out of the wound, but I can push it upward and to the right, thus exposing the upper jejunum, which appears normal, though relatively of large caliber. The transverse mesocolon toward the splenic flexure is fortunately lax enough to permit a fold of the cardiac pouch of the stomach to be delivered through it, but I am unable to get enough slack for the usual technic. However, by using these shorter curved clamps and doing the suturing with a curved needle and a needle forceps and working within the abdomen, I can get along fairly well. A running suture of silk now being placed posteriorly, I incise the stomach and the jejunum, and while the intestine has normal mucous membrane enough and to spare, the stomach, instead of showing a redundancy, seems to have a very thin mucous lining. Completing the anastomosis in the usual manner, the abdominal wound is ready for suture. Before closing the incision, as this patient's body fluids are greatly reduced, I will ask the nurse to pour a quart of normal salt solution into the abdomen. It is seldom that I have occasion to resort to this expedient, but the response as shown by the character of the pulse is salutary and prompt. I have been watching this patient's condition during the operation very carefully, and should have contented myself with a

simple jejunostomy had she not been withstanding the anesthetic or the operation well.

This patient will be given nourishment by mouth at the end of the first twenty-four hours. Her state of nutrition is so very low that I am afraid of another week of starvation. Liquids by rectum, mostly water, of course, will be continued up to the limit of her capacity to retain them.



CONTRIBUTION BY DR. FREDERICK B. MOOREHEAD  
AND DR. KAETHE W. DEWEY<sup>1</sup>

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COMPOSITE ODONTOMA

*Summary:* Clinical aspect of present case—detailed analysis of tumor removed at operation. Composite odontoma a rare lesion—reported cases.

**Clinical History.**—The patient, a young man of twenty-three, first noticed a numbness in the left lower lip. The numbness was not preceded by pain as is usual in such cases due to pressure on the inferior dental nerve. A swelling slowly developed in the left lower jaw at the angle which increased in size until it was noticeable at a distance. The teeth on that side were lost, probably through ordinary alveolar infection.

The swelling was uniform, hard, and occupied the body of the bone, the bulging being equal lingually and buccally. The overlying soft tissues were normal in appearance and a clinical diagnosis of composite odontoma was made from the examination and x-ray. Under novocain nerve-block an incision was made over and parallel with the alveolar ridge. On retraction of the soft tissue the bony mass was exposed. The external and internal plates of bone were quite thin and easily removed with a chisel, liberating the tumor, which was easily lifted from its bed. The fibrous sac, described in the report, was easily dissected out. The wound was packed with iodoform gauze saturated with compound tincture of benzoin.

Attention is called to the character of this dressing for wounds, particularly in the jaws. The ordinary iodoform pack is a foul-smelling affair when removed twenty-four hours later, but when compound tincture of benzoin is used the dressing remains sweet and free from odor for several days.

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The cavity entirely filled in with new tissue in four months after the operation, leaving no deformity or disability. The inferior dental nerve was divided in removing the fibrous sac. This has since regenerated, restoring sensation to the lower lip.

The tumor as shown in this *x*-ray picture was kidney shaped and was placed with the long axis vertically to the jaw, with the concave side directed anteriorly (Fig. 221). The crown of a



Fig. 221.—*x*-Ray picture of the tumor *in situ*.

molar was placed against the surface of the tumor at its lower extremity, only one root was visible, the apex of which was curved and directed downward and backward (Fig. 222).

I have here the gross specimen. This tumor measures 3.5 x 2 x 2 cm. and weighs 20.5 gm. (Fig. 223). The convex surface is, for the larger part, of a dull grayish-yellow color, which is dentin tissue; the other part, viz., about one-third, is covered with a pearly white scaly like layer of



Fig. 222.—Drawing from the x-ray picture, showing the tumor as viewed from the inside of the mouth.



Fig. 223.—Drawing of the tumor, natural size, showing the position of the molar tooth and nodular elevations on the surface of the tumor, composed of enamel. The other surface is almost entirely free from enamel tissue.

enamel, which is continued over almost the entire concave surface, where it assumes the form of stalactitic excrescences. There is an exact negative of the crown of the attached



molar on this surface at one end. Also these indentations are for the most part covered with enamel. The whole layer of enamel formation has a depth of 2 or more mm. Where a portion of the tumor has been sawed off for microscopic preparations the surface shows compact, dull, yellowish-gray tissue,

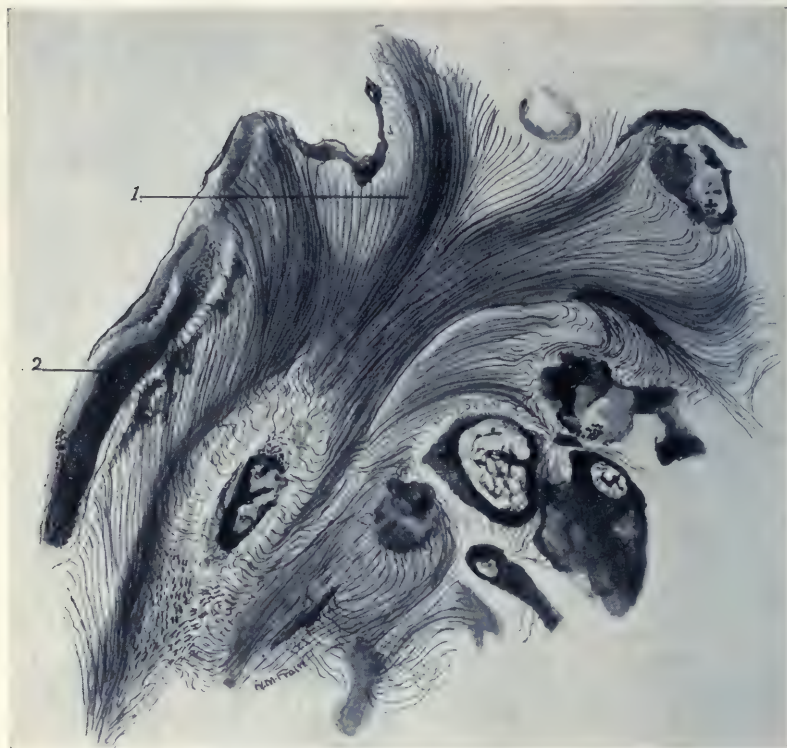


Fig. 224.—Drawing from a ground section. Fan-like spreading of the dentinal tubules (1). At the periphery, to the left, enamel tissue (2).

evidently all dentin; enamel is seen only at the periphery. The tumor was surrounded by a thick fibrous capsule. The tooth is a typical second molar. There are two roots fused into one; the smaller one is crippled in all dimensions, but distinct in outline, and is lying flatly and squarely on the other.

This specimen was fixed in 10 per cent. formalin. A piece

was sawed off, decalcified, and frozen sections prepared for staining with hematoxylin and eosin, and the various methods for demonstrating the lipoids. The study of the lipoids in this tumor was done with particular care, because there is not yet anything in the literature about fat or cholesterol in odontomas. A small portion was embedded in paraffin. Also a ground section was prepared.



Fig. 225.—Drawing from a ground section. In the center cementum (1) containing numerous cement corpuscles (2), To the left, dentin (3) capped by enamel (4), resembling a tooth in miniature.

The main substance in this tumor is dentin (Fig. 224). There are numerous well-defined spaces which represent the pulp chambers, some of which are filled with tissue resembling that of the pulp; it is very cellular and contains blood capillaries; some are empty, others are occupied, partially or totally, with

a more or less homogeneous material which stains intensely blue with hematoxylin. The border zone of the surrounding tissue is often such deeply staining material. This is dentin supplied with dentinal tubules which often radiate from the spaces; sometimes it is heaped up in irregular conglomerations. There are blood-vessels in the compact tissue. The general appearance is that of innumerable small teeth placed closely together. The pulp chambers are disproportionately large (Fig. 225).

In Sudan III stained sections the lipoids which occur in this tumor have an orange-yellow color. There is a considerable amount of this present; the pulp tissue shows the most marked degree of lipid infiltration (Fig. 226). There is practically no neutral fat present. The lipid substances occur in more or less fine granules, staining orange red with Sudan III and purplish with Nile blue. It is very likely that a considerable portion of the lipid material has been lost in the process of preparing the sections. In many regions the dentinal tubules are filled with a finely granular material. Sometimes a direct connection of the lipoids in the tubules with those in the pulp spaces is plainly visible. Most of these substances are cholesterol esters or mixtures of cholesterol with fatty acids. Very little material is found which is positive with Fischler's method, the specific stain for fatty acids and soaps, although in sections stained with Nile blue a good deal of the homogeneous material which lies within spaces or at the borders is stained blue, indicating the presence of fatty acids.

The thick capsule consists of connective tissue, covered on the outside with a thick layer of squamous epithelium, which resembles the mucous membrane of the mouth. It is, however, very much degenerated, and in some regions altered beyond recognition; in others it is even completely destroyed. Where it is still present in a broad zone it is broken up by proliferating connective-tissue papilli and nests which are infiltrated, and often completely filled with plasma-cells. These cells also replace the destroyed epithelial tissue and densely infiltrate a zone of the subepithelial tissue, so that, in fact, one-half of the width



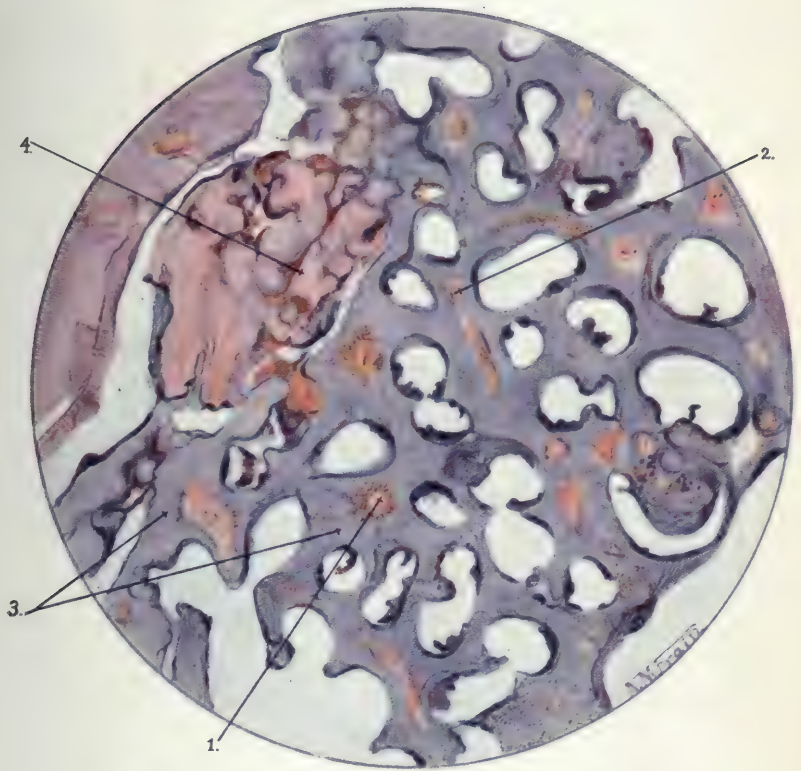


Fig. 226.—Drawing from a frozen section stained with hematoxylin and Sudan III. Lipoid substances (cholesterol mixtures) occur in fine granules in the tissue of pulp chambers (1), in degenerated blood-vessels (2), and in dentinal tubules (3), cut transversely and longitudinally. The largest amount is seen in conglomerated masses of dentin and cementum (4) on the left side of the drawing.

laid down in an orderly fashion, there is for some unknown reason an aberration of the process, and enamel, dentin, and cementum are formed without respect to law or order. It is an exalted, disorderly formation of tissue.

Nutritional disturbances taking place in the enamel and dentin cells, as Krogus has already pointed out, must be considered as secondary effects of the pathologic changes in the pulp. Pressure is exerted by the hypertrophic pulp on the tissue forming the enamel and dentin, and it sometimes happens that the enamel organ, which is less resistant than the dentin, atrophies completely; in such cases the fully developed odontoma shows only dentin and no enamel.

The composite odontoma is a rare tumor. General statements in the literature concerning the number of cases on record are somewhat contradictory and probably incorrect. Heath<sup>1</sup> in 1887 compiled all the cases which to his knowledge had been reported since 1809, and enumerated 9 cases, including a case which he had observed. According to a later publication by the same author<sup>2</sup> 11 cases were recorded up to 1894. This list, however, is not complete. In the compilation by Krogus<sup>3</sup> in 1895 some of the cases overlooked by Heath are added, and 18 cases in all were collected. In Krogus' carefully collected cases some reports have been left out; 5 of these we find mentioned by Sutton.<sup>4</sup> In 1905 Schumann<sup>5</sup> records 34 cases. A careful survey of the literature<sup>6</sup> reveals a record of 40 cases

<sup>1</sup> Heath, C., *Lectures on Certain Diseases of the Jaws*, Brit. Med. Jour., 1887, 1, 1375.

<sup>2</sup> *Ibid.*, *Injuries and Diseases of the Jaws*, 1894, 4th ed.

<sup>3</sup> Krogus, A., *Ueber die odontoplastischen Odontoma, nebst Mitteilung eines neuen einschlägigen Falles*, Arch. f. klin. Chir., 1895, 15, 275.

<sup>4</sup> Bland Sutton, J., *Tumors, Innocent and Malignant*, 1893, p. 31.

<sup>5</sup> Schumann, E., *Uebereinen Fall von Odontom am Unterkiefer nebst einer Uebersicht über die vom Zahnsystem ausgehenden Kiefergeschwülste*, I. D., Leipzig, 1905.

<sup>6</sup> Billroth, Th., *Ueber die Struktur pathologisch-neugebildeter Zahnsubstanzen*, Virch. Arch., 1855, 8, 426.

Black, G. V., *Report to the Illinois State Dental Soc.*, 1879, quoted from Gilmer.

Dunkerly, J. W., *Odontomes*, Brit. Jour. Dental Science, London, 1892, 25, 1.

since 1909, which is a rather small number for so long a period.

In earlier reports these tumors were described under various names, for example, "excroissances pierreuses, tumeur mame-lonnée, dure et comme pierreuse," or simply as exostoses. The term "odontome" as a name for a definite group of tumors of the dental system dates from the work of Broca<sup>1</sup> published in 1869, who thoroughly investigated the cases on record, identified the characteristics common to all these seemingly different structures, and united them into one class. His classical studies have laid the foundation of our present knowledge of odontomas. His classification, however, has been criticised as not being based on histologic facts. The classification made by Bland Sutton, which has a purely anatomic basis, has received a wider recognition. Sutton's definition of an odontoma is that of a

Partsch, Ueber zwei Fälle von Odontomen, D. Mon. f. Zahnk., 1892, 10, 223.

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Sachse, B., Ein Odontom, D. Monatschr. f. Zahnheilk., 1903, 21, 36.

Amoore, J. S., and Gibbs, J. H., Brit. Dent. Jour., 1904, 25, 185.

Payne, J. L., A Case of a Composite Odontome, Jour. Brit. Dental Assoc., 1904, 25, 401.

<sup>1</sup> Broca, P., Traité des tumeurs, Paris, 1869, tome 2, 275.



"tumor composed of dental tissues in varying proportions and different degrees of development arising from teeth germs or teeth still in the process of growth." As such it may be, first, a soft or calcified epithelial tumor, derived from the enamel; second, an aberration of the tooth follicle and develop into a follicular cyst or a fibrous odontoma; third, an aberration of the papilla, and be called a radicular odontoma or a dentoma or an osteodontoma; fourth, an aberration of the whole tooth germ, and be called a composite odontoma, because it is composed of all the tissues of the tooth germ. From the standpoint of such an embryoplastic and odontoplastic basis all these tumors are odontomas; it is customary, however, to apply this name only to the fourth group, namely, to hard tumors of the jaw which are composed of fully developed enamel and dentin. These tumors are composite, according to Sutton, not only in that they "originate from all the elements of the tooth germ, but they are composite in another sense; many of these tumors are composed of two or more tooth germs, indiscriminately fused. But they differ from the cementomata containing two or more teeth in the fact that the various parts of the teeth composing the mass are indistinguishably mixed, whereas the individual teeth implicated in a cementoma can be clearly defined." Baume<sup>1</sup> also separates the odontoma and counts to the latter only those odontoplastic malformations which develop into growths exceeding the size of a tooth. He divides the real odontoma into coronary or crown-odontomes and radicular or root-odontomes.

While some types of the odontomas are not infrequently observed in animals, especially in the herbivora, composite odontomas have been found only in man.

Although the origin of these anomalies is evident, namely, some disturbances in the development of the tooth germ, we do not know anything concerning the cause of such disturbances. Trauma does not seem to play a part. There are a few cases on record in which there was a history of some external violence, and even in these it is not absolutely clear that trauma was the

<sup>1</sup> Baume, R., *Lehrbuch der Zahnheilkunde*, Leipzig, p. 146.

only decisive factor. "The only etiologic factor which we know is age," Krogius writes. Odontomas, of course, cannot arise after the development of the teeth is complete, and, in fact, the majority of the odontomas have been observed in young adults. There are a few exceptions. Salter<sup>1</sup> reported an odontoma in a man of thirty-five years. Rupture of this tumor through the gingiva occurred; later a similar growth developed in the same place. Arkövy<sup>2</sup> reported an odontoma in a man thirty-five years old. The largest odontoma known is one observed by Hilton<sup>3</sup> in a man aged thirty-six years. Such exceptions, however, do not contradict the rule. In Salter's case the tumor arose in connection with a supernumerary tooth; Arkövy's is not quite clear on this point; in Hilton's case the odontoma occurred in the antrum. These exceptions probably all refer to odontomas which originated from aberrant anlage and not from developmental disturbances of the normal tooth germ.

Spontaneous expulsion of the tumor occurred in a case reported by Harrison, which Heath has mentioned, also in the cases of Hilton and Rushton Parker.<sup>4</sup> With a few exceptions the tumors were located in the lower jaw. Some of the cases in older reports and those described by Andrew and Colyer are odontomes in the upper jaw. Lloyd<sup>5</sup> described a tumor in the maxilla in a man of twenty-one years, who gave the history of a blow on the right upper jaw some time previous to the symptoms. Most of the odontomas showed the impression of a retained tooth. In Salter's case the patient had a full complement of teeth. The size of these tumors should exceed that of a tooth, according to Baume. Two were as large as a hen's egg. The largest composite odontoma known is that observed by Hilton in a man of

<sup>1</sup> Salter, J., Contribution to Dental Pathology, Guy's Hospital Reports, 1858, 4, 279.

<sup>2</sup> Arkövy, J., Ueber ein Odontom, Oesterr. Ung., Viertelj. f. Zahnheil., 1887, 1, 6, quoted by Krogius.

<sup>3</sup> Described by Bland-Sutton, loc. cit.

<sup>4</sup> Rushton Parker, Odontoma of the Second Lower Left Molar Tooth, Tr. Path. Soc., London, 1881, 32, 240.

<sup>5</sup> Lloyd, J., Composite Odontome of the Upper Jaw, Removal, The Lancet, 1888, 1, 64.

thirty-six years and diagnosed as an exostosis. The tumor weighed nearly 15 ounces and measured 27.5 cm. in its greatest circumference. The second largest tumor, observed by Duka,<sup>1</sup> weighed 1060 grains, and measured nearly 3 inches in its widest diameter. Denticles or conglomerations of teeth are sometimes reported as composite odontomas, but are not recognized by such authorities as Colyer, Schmidt, etc., as belonging to the class of composite odontomas. An unusual case of this type was observed by Hildebrand,<sup>2</sup> where 150 to 200 individual teeth were counted, and Goebel<sup>3</sup> quotes a case of a conglomeration of teeth, the number of which was estimated at several thousand.

The predominating substance in composite odontomas is dentin. Enamel is not constantly present; it may be entirely lacking. Also the presence of cementum is inconstant. Sometimes bony substances are found. Krogius believes that such osseous tissue is not to be considered as equal to real cementum, but that it results from a fibrous transformation and subsequent ossification of the pulp. The presence of a connective-tissue capsule is mentioned only in a very few cases.

<sup>1</sup> Duka, A., Case of Removal of a Part of Superior Maxillary Bone on Account of a Bony Tumor in the Nasal Fossa, *Tr. Path. Soc.*, London, 1866, 17, 256.

<sup>2</sup> Hildebrand, C. H., Beitrag zur Lehre von den durch abnorme Zahnentwicklung bedingten Kiefertumoren, *D. Ztschr. f. Chir.*, 1890, 31, 282; *Ibid.*, 1893, 35, 804.

<sup>3</sup> *Loc. cit.*



## CLINIC OF DR. GOLDER L. McWHORTER

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### SURGICAL TREATMENT OF EMPYEMA

*Summary:* Developments in the treatment of empyema during the past year demonstration of a case treated by intercostal siphon drainage.

DURING the past year the treatment of empyema has undergone various changes. This is due to the fact that early rib resection brought poor results, especially in the virulent empyemas due to the streptococcus associated with toxic pneumonia. Results of experimental and clinical research along this line have shown indications for different methods of treatment, and also that each case must be carefully considered before deciding the method to be used. The method of irrigating empyema cavities has been reintroduced, but with the added use of the chlorin solutions.

Methods to avoid an open pneumothorax have been used for years by a number of men. Buelau,<sup>1</sup> one of the first to advocate this method, introduced a large catheter through a trocar, which was then withdrawn. Negative pressure was produced by the siphon action of a long rubber tube filled with pus. At that time Schede stated that the mild cases could be treated in this manner, but the serious ones should have a resection. Perthes<sup>2</sup> resected a rib and inserted a rubber tube with a broad collar which was made air tight by covering with petrolatum and stretching tight against the chest. For negative pressure he used a water pump with a manometer attachment; others used the gravity siphon water-bottles. Many modifications of these methods have been made. Valve action drains without any suction have been used.

In reviewing the recent reports there seems almost a general disapproval of wide open thoracotomy in cases with toxic pneumonias or in virulent streptococcus empyemas. Substitution of this treatment by repeated aspiration until the fluid has become creamy and the pneumonia improved has given better results, with a late open thoracotomy.<sup>3, 4, 5, 6</sup> One recent report from Camp Doniphan is an exception. The writers conclude that the best results in all types of empyema follow immediate operation with rib resection and drainage.

Aspiration in some cases has been followed by cure without drainage.<sup>4, 9, 10</sup> This has, perhaps, led to the use of intermittent or continuous aspiration by means of a permanent rubber tube through a small intercostal opening.<sup>8, 9, 10, 11</sup>

The chlorin antiseptics or formalin and glycerin<sup>6, 7, 8, 9</sup> have been used in conjunction with these methods of treatment. Stoney<sup>12</sup> and many others place great reliance upon Dakin's solution. Stoney allows the external wound to heal, and reports patients discharged apparently healed, with a pneumothorax. He states that in these cases it is unnecessary to obliterate the cavity by distention of the lung or by a chest wall plastic.

Whittemore<sup>13</sup> uses a catheter drain with a siphon suction only in cases critically ill. He uses a long tube for the siphon action and keeps the end of the catheter under water. He performs the Lilienthal operation primarily on all cases not desperately sick. Homan<sup>14</sup> recommends rib resection as the original operation. He does the Lilienthal operation only in cases where the lower lobe is not adherent far out on the diaphragm, but near the midline, and is unable to expand and fill out the cavity. He shows that where the lung surface is concave it will balloon out and fill the cavity, but where the lower lobe is adherent near the midline and where the surface is convex, as shown by the Roentgen ray, the conditions are unfavorable for expansion and a Lilienthal operation should be done early.

The Lilienthal operation consists of a long intercostal incision followed by spreading the ribs widely apart and the removal of the fluid pus and the fibrin layer covering the costal

and visceral pleura, allowing the lung to expand. The pleural cavity is closed tight after the lung is expanded by means of the positive gas-oxygen pressure, except for small drains at the ends of the incision. Lilienthal<sup>15</sup> reports a series of 100 cases where this was done. He reports very few chronic cases and a fairly low mortality.

Recently Graham and Bell<sup>16</sup> have emphasized the dangers of creating a large open pneumothorax during pneumonia. They have shown that with a normal mediastinum the normal thorax may be regarded as one cavity instead of two. Any change of pressure in one pleural cavity is accompanied by practically an equal change in the other, so that an equilibrium exists at all times throughout the whole thorax. If the mediastinum is rigid or fixed by adhesions, then a pleural opening on one side will not produce the same pressure changes in both pleural cavities. When the amount of air taken into the lungs is limited by the presence of pneumonia and there is an excessive demand for air, with a weakening of the muscles of respiration which aid compensation, the size of a pleural opening compatible with life becomes smaller. Under critical conditions even a small open thoracotomy wound may produce death from asphyxia.

#### DEMONSTRATION OF CASE

The patient, J. S., No. 122,612, entered the hospital February 23, 1919, on the medical service of Dr. J. B. Herrick. He had been sick three days with fever, headache, backache, and a bad cough. On examination, there was impaired resonance over the bases of both lungs and a high fever. A diagnosis of influenza with bronchopneumonia was made. On February 27th he had very marked pain in the left side and coughed a great deal. On March 2d he was very weak and seriously ill. On March 3d there were evidences of consolidation of the whole left lower lobe and one patch in the right lower lobe posteriorly. Patient in serious condition. On March 4th complained of severe pains in left chest, which were worse when lying on the left side. Condition about the same. On March 10th a thoracentesis of left side was done, but no fluid was obtained. On March 12th



purulent fluid was obtained from the left side, 5 c.c. being removed.

The heart was displaced to the right. There was dulness 8 cm. to the right, with an impulse beat in the right midclavicular line.

The temperature for the first twelve days in the hospital varied from 104° to 102° F., and it touched normal for the first time on the fourteenth day. Then it gradually increased until when he was operated for empyema it was 101.6° F.

Urine on February 24th showed albumin present, a few white blood-cells; no casts. A twenty-four-hour specimen showed no albumin and was negative throughout.

Blood examination on February 24th showed hemoglobin 68 per cent.; 6400 white cells.

Blood-pressure on February 24th was 110 systolic and 64 diastolic. On March 7th the hemoglobin was 72 per cent. and white count 21,400.

On March 8th, five days before operation, stereoscopic plates (Fig. 227) gave evidence of fluid in the left chest. There were evidences of pneumonia present.

He was transferred to my service on March 13th. Operation under local anesthesia. A small needle was first put in and pus aspirated; then a short incision, with the soft parts pulled up to aid valve formation, was made in the eighth interspace in the scapular line. The point of the knife was introduced through the wall very cautiously, hugging the upper border of the rib. A small grooved director was introduced along the knife, which was withdrawn. A stilet was put into a No. 18 French catheter with two extra fenestra near the end. This catheter was then pushed through the small incision directed and maintained by the grooved director until the end had entered the empyema about 5 or 6 cm. The tube was aspirated and pus obtained. It was temporarily clamped and fastened firmly with adhesive strips over a small pad of gauze.

The patient was returned to his bed and a long tube connected with the catheter and the end placed in a large bottle on the floor. Pus began to drain immediately. On the third day in-

creased negative pressure over the siphon action of the tube was obtained by means of two large gravity siphon water-bottles. The drainage bottle was arranged air tight and a vacuum maintained by the suction from the siphon water-bottles, changing them as the water ran out. This suction method was maintained for several days until the patient was able to sit up for a short

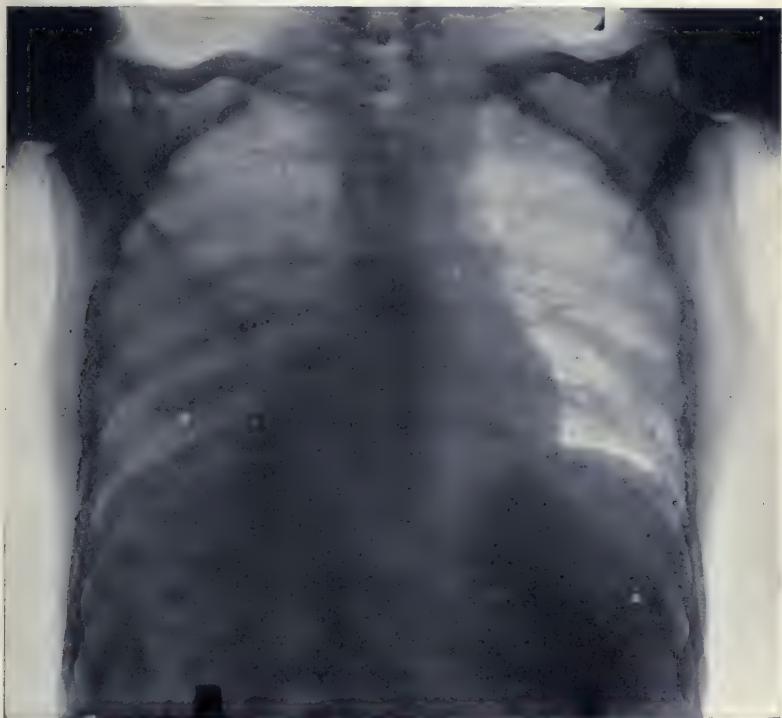


Fig. 227.—Five days before operation. Evidence of fluid, pneumonia, and displacement of viscera.

time in a wheel chair on the sixth day, when it was discontinued. The patient was instructed in light graduated exercises and to use the bottles by blowing the water from one to the other. He was able to walk around on the twelfth day. The temperature following operation dropped from 101.6° F. to normal in twenty-four hours. The 8 P. M. temperature during convales-

cence rose to 99° F. a few times, but at no time did the temperature go higher. The drainage was accurately measured each day until the tube was removed.

	C.c.		C.c.
March 14.....	850	March 25.....	45
15.....	25	26.....	80
16.....	120	27.....	30
17.....	120	28.....	50
18.....	45	29.....	50
19.....	15	30.....	15
20.....	30	31.....	15
21.....	105	April 1.....	12
22.....	60	2.....	10
23.....	80	3.....	6
24.....	70		

On April 4th the tube was removed and a small collapsible tube of rubber-dam inserted. A dressing was placed over the end of the rubber drain. April 7th drain was changed. A small amount of stringy mucoid discharge from the rubber drain. Smears and cultures taken. Only a few organisms to the field. A pure culture of pneumococcus present.

Weight on March 24th was 113 pounds and on April 7th was 123 pounds.

On measurement of the amount of expansion of the two sides of the chest, there is at this time  $\frac{1}{2}$  inch less on the affected side. The heart-beat and dulness have returned gradually to nearly normal. Stereoscopic Roentgen plates were taken eighteen days after operation (Fig. 228). The heart has returned to a practically normal position. There is some evidence of a thickened pleura, otherwise practically negative. On April 9th no discharge and the drain was removed. On April 11th, twenty-nine days after operation, the wound practically closed and the patient was discharged with instructions to report every two days. On April 14th wound healed.

This method of drainage through an intercostal incision just large enough to insert the tube allows for adequate drainage provided it is not plugged with fibrin or thickened pus. Aspiration will then usually clear the tube, or it may be cleared by injecting it



full of normal salt solution and aspirating with a syringe. However, it may be necessary to change the tube. Where there is a persistence of symptoms the aspirating needle should be used to locate pus-pockets.

The valve formation of the skin and muscle around the small opening will tend to prevent pneumothorax with the aid of a



Fig. 228.—Eighteen days after drainage of empyema. Some thickness of pleura. Rubber catheter intercostal drain still in place.

small pressure pad over the wound. After adhesions form these precautions are not necessary. Increased negative pressure by some mechanism after gradual drainage of the pus is of considerable value, especially for a few days. Blow bottles and early exercises assist in expanding the lung. The drainage-tube must not be removed too early, but replaced by smaller drains.

Intercostal drainage is often impossible in old cases due to the close approximation of the ribs with partial collapse of the chest wall. In these cases or in secondary operations rib resection is usually necessary.

Irrigation of the cavity and even aspiration of the fluid may produce collapse or death, probably due to the pleural vago-sympathetic reflex.<sup>17</sup> The value of Dakin's solution other than its antiseptic action is in the proteolytic dissolving action on the fibrin coating of the lung, which prevents its expansion, and on the clots which may plug the drainage-tube. No irrigation was done in this case.

This simple closed thoracotomy has definite advantages, especially so in a selected number of serious cases requiring a wider range of safety than that provided under the open pneumothorax method. Constant watching of the drainage-tube and asepsis for the prevention of secondary infection are necessary.

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## CLINIC OF DR. ALBERT E. HALSTEAD

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#### DIVERTICULA OF THE ESOPHAGUS

*Summary:* Varieties and pathologic anatomy of diverticula of the esophagus; etiology; symptoms and diagnosis—the x-ray—the proper use of sounds and stomach-tubes—the method of Jung; treatment usually surgical—Dr. Halstead's two-stage operation.

GENTLEMEN: The patient I wish to present to you today is Mr. G. W., age thirty-nine, white, American, married, no children—wife now pregnant and at term. He complains of (1) inability to swallow food, both liquid and solid. He first experienced difficulty in swallowing about twelve years ago. During the last three years he has become much worse. At the present time he can take liquid food only when in the recumbent position with the head and shoulders lower than the body. In the early stage of his disability he noticed that granular foods, seeds, rice, etc., were swallowed with more difficulty than soft solid foods and liquids. (2) Regurgitation of food after taking a small quantity. The first food taken seems to lodge just below the line of the upper border of the sternum. Regurgitation of both food and water has been noted for about two years. During the last three months it has been most troublesome. Of late, only small quantities of liquid food can be taken at a time. (3) Loss of weight. He has lost weight steadily for three years. He believes he has lost 18 pounds in the last three months.

There is no history of pain during the act of swallowing or after. After taking food the neck feels full. This feeling is referred mostly to the left side, just above the upper end of the clavicle. Upon compression of the neck, food may be made to regurgitate into the mouth. When this is accomplished the

feeling of fulness and the slight dyspnea associated with this fulness disappear.

Family history is negative.



Fig. 229.—Diverticulum of esophagus.  $x$ -Ray of patient after swallowing bismuth mixture. The diverticulum is distended, so that its position and form can be easily determined.

Personal history is negative. Had the common diseases of childhood. Denies venereal disease.

Habits good. Does not use drugs or alcoholic drinks.



Smokes moderately. There is no history of ingestion of corrosive liquids; none of injury to the neck.

*Physical examination* shows a rather pale, emaciated, middle-aged man. Has the appearance of having some wasting disease. Skin sallow. No scars or marks apparent. Muscles weak and flabby. Bones and joints negative.

Head, negative.

Neck, negative, except after ingestion of food or water, when there appears a swelling to the left of the median line just above the sternoclavicular articulation. This disappears on pressure or when upon making an effort to vomit, the food previously taken is forced back into the mouth.

On passing an esophageal bougie it can be introduced to a depth of 9 inches, when its progress is arrested. At no time since he has been on this service could we introduce either a bougie or stomach-tube into the stomach. The point of arrest was always the same, about 9 inches from the incisor teeth.

Bismuth swallowed was shown by the  $x$ -ray to pass into a pouch, the orifice of which was just behind the cricoid cartilage. The sac when filled reached to a point  $\frac{3}{4}$  inch below the level of the sternal notch and occupied a position somewhat to the left of the median line of the neck (Fig. 229).

Chest, negative.

Abdomen, negative.

From the above history and from our findings upon physical examination we must conclude that the obstruction that we find is due to a diverticulum of the esophagus.

For convenience of description there may be included under the head of diverticula of the esophagus:

A. Pressure or pulsion diverticula:

1. Those of the pharynx.
2. Those of the pharyngo-esophageal junction: the borderline cases or the *Grenz diverticula* of Rosenthal, also known as Zenker's diverticula.
3. Diverticula having their origin near the bifurcation of the trachea just above the left bronchus. These are the epibronchial diverticula of Leutgert.

4. Deep-seated diverticula, mostly found near the esophageal opening in the diaphragm. These are also called epiphrenal. The orifice is generally a short distance above the diaphragm, the fundus of the sac resting upon it.

B. Traction diverticula.

C. Traction-pulsion diverticula.

Diverticula of the first group are found in the lateral pharyngeal wall. They are mostly congenital in origin. They frequently are in the beginning remains of the third and fourth branchial clefts, starting as incomplete branchial fistula, that have from pressure from within gradually assumed the shape and characteristics of a pressure diverticulum. They may also originate in a congenital pouch-like recess found on the posterior pharyngeal wall, similar to the pharyngeal pouches found in certain animals, such as the pig, camel, and elephant.

Congenital strictures of the upper end of the esophagus may have an important bearing upon the development of any of these pharyngeal diverticula.

*Trauma*, causing a weakening or rupture of the pharyngeal wall, may also be the cause of diverticula. Cases are reported where foreign bodies, lacerating the pharynx, have been the essential cause in the development of pharyngeal diverticula.

Excessive *pressure* upon the pharyngeal wall from long-continued blowing in wind instruments may, in case of congenital defect or when the pharyngeal wall has been weakened by disease or trauma, be an important factor in the development of diverticula. In these cases a pouch of mucous membrane is forced between the fibers of the muscular wall of the pharynx; later retention of food with the ever-increasing pressure from within may result in a typical pressure diverticulum.

The *second group*, the pharyngo-esophageal pulsion or pressure diverticula, although not most common, are the most important both from a clinical and pathologic standpoint.

They develop exclusively in the median line posteriorly. At times from traction, as the sac grows larger and is compressed against the vertebral wall, it is displaced to one side, usually

the left, the fundus of the sac being in relation to the lateral wall of the esophagus. In the course of development of the pouch the esophagus is also displaced, so that the axis of the pharynx and the orifice of the diverticulum are in a line, permitting easy entrance of food into the sac and obstructing the lumen of the esophagus. Their point of origin corresponds to a triangular space just below the inferior constrictor, where, by separation of the longitudinal muscular bands of the esophagus, and an absence of the circular muscular fibers, there is normally a defect in the musculature of the esophagus. This weak point is known as the Lanier-Hackermann point (Fig. 230, 1). It is here that a hernia of the mucosa takes place with the greatest ease. On a level with this point the esophagus is narrowed and is fixed in front by its relation to the cartilaginous larynx, so that any increase in pressure from within must unequally distend the posterior wall (Fig. 230, 2). In case of arrest of an unusually large bolus of food or of a foreign body it is this weak point that bears the impact.

The picture of a typical diverticulum of this group is that of a sharply defined protrusion of a portion of the wall of the esophagus. The size varies from a pea to that of a large pear. They are pear shaped or cylindric, with an orifice considerably smaller than the circumference of the sac. The larger ones have a thick wall resembling the wall of the esophagus. In the smaller ones the walls are thin and transparent. In none do we find a complete muscular layer. The sac is made up of mucous membrane covered by a layer of connective tissue. Near the neck may be found a few bundles of muscular tissue drawn from the inferior constrictor.

In structure this group differs from those of the pharynx, which may have a complete muscular layer, and from those of the lower end of the esophagus, in which no muscular tissue is found around the neck of the pouch. The mucous membrane rarely ulcerates or becomes actively inflamed. Carcinoma or papillomatous degeneration rarely occurs.

3. Diverticula having their orifice just above the level of the left bronchus are occasionally found. These are etiologically



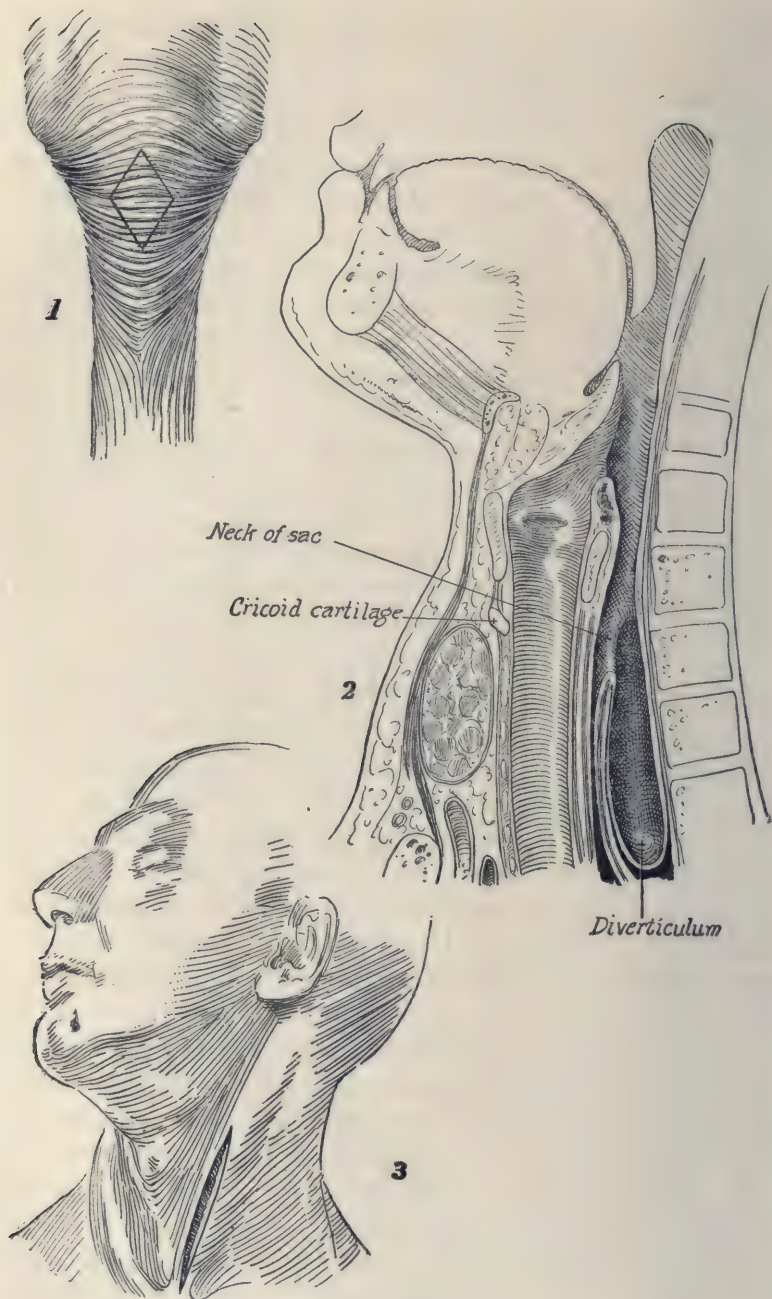


Fig. 230.

distinct from Zenker's diverticula. At this point there is a distinct fossa, caused by the relation of the left bronchus to the esophagus. This fossa is known as the epibronchial fossa of Leutgert. The presence of this fossa determines the origin of pressure diverticula as well as constituting an important etiologic factor in the causation of carcinoma of this portion of the esophagus.

The fossa of Leutgert, due to a pushing in of the anterior esophageal wall by the left bronchus, varies in size in different individuals. At times it is deep enough to contain the terminal phalanx of the finger. In others it is a mere dimple. The fossa when deep gradually increases in size until, by arresting food, it becomes sacculated and assumes the shape and characteristics of a diverticulum.

4. The epiphrenal diverticula belong to the traction-pulsion group. They have been found mostly on the anterior and lateral walls of the esophagus. Inflammatory bands connecting them with the mediastinal glands show them to have been originally traction diverticula. They have seldom been recognized during life. Occasionally they appear to be primarily pulsion diverticula. This opinion is based upon those cases reported where no fibrous tissue or degenerated glands have been found in near proximity.

B. Traction diverticula, as the name suggests, have their origin in a pouch-like process of the esophagus, which by traction through an inflammatory band has been drawn into the neighboring connective tissue. These are much more common than those due to pressure, but are of slight clinical significance.

They are small, occur in the anterior wall of the esophagus, and generally have their orifice directed downward. They seldom produce symptoms during life and are mostly of interest to the pathologist. Infection of bronchial or mediastinal glands, with the consequent inflammation spreading to the esoph-

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Fig. 230.—Diverticulum of esophagus. 1, Weak spot in posterior wall of esophagus. 2, Sagittal section showing relation of diverticulum to the esophagus, trachea, and larynx. 3, Incision for exposure of diverticulum.

agus, with subsequent contraction of the inflammatory band connecting the gland with the esophagus, explains their origin.

Occasionally by the lodging of sharp foreign bodies they become a menace to life. Cases are reported where perforation by a foreign body has caused a fatal mediastinitis. Others have reported sudden death through penetration of the pulmonary artery by a sharp foreign body lodged in a traction diverticulum.

C. Traction-pulsion diverticula are those traction diverticula which by retaining food become pressure diverticula. They have, in the beginning, the same location and characteristics as traction diverticulum. When by pressure they become enlarged they constitute an important though relatively uncommon group.

**Symptoms.**—The first symptoms that attract attention are those of a gradually increasing stenosis of the esophagus, inability to swallow at first *granular food*, such as rice, beans, etc. In many this difficulty in swallowing dates from early childhood. Here we may assume that a *congenital* narrowing of the esophagus may both explain the symptoms of obstruction and also be an etiologic factor in causing the diverticulum.

As the sac grows larger more and more food is collected and retained, sometimes for several days. As the walls of the sac contain no muscular fibers, spontaneous emptying except during the act of vomiting is impossible. Fermentation takes place. When the diverticulum attains a certain size pressure from the distended sac occludes the esophagus, so that any food taken after the sac is filled regurgitates into the mouth or is expelled from the mouth. Regurgitation with subsequent chewing and swallowing gives the clinical picture of rumination. In certain cases where the diverticulum is of moderate size, after the sac becomes filled at the beginning of the meal, the orifice is so displaced by traction of the filled sac that it is no longer in a direct line with the pharynx. In these cases food taken after the sac is filled passes directly into the stomach without hindrance.

In nearly all cases as the sac grows the lower border of the orifice forms a valve-like projection into the lumen of the



esophagus and closes it completely after the diverticulum is filled. As the orifice is directed upward, swallowing of solids and liquids may be accomplished by taking food while the body is reclining with the head and neck down. The ability to take food while in this position only is one of the most characteristic signs of diverticulum.

Pain after eating usually is present when the diverticulum has reached a sufficient size to obstruct the esophagus by pressure. This pain is relieved by emptying the sac either through the act of vomiting or by pressure upon it. The pain is generally referred to the root of the neck or is retrosternal. Colicky epigastric distress after taking food has been noted. This symptom is common both to diverticula of large size and to cardiospasm.

In large diverticula a swelling of the neck or a circumscribed tumor may be seen after eating. Lateral pressure with the fingers made behind the trachea will generally empty the sac and cause the tumor to disappear. When this can be accomplished, food ingested several days before may be expelled.

**Diagnosis** of diverticulum of the esophagus is based mostly upon the clinical history, the subjective symptoms above mentioned, and upon the evidence obtained by the use of the sound. The skiagraph may be employed with positive results by filling the sac with bismuth mixture (Fig. 229) or by introducing a metallic sound or rubber tube filled with shot. By this means the depth and position of the sac may be ascertained, which is of importance in deciding upon the advisability of an operation. In a diverticulum high up in the esophagus and in diverticula of the pharynx the use of the esophagoscope gives positive findings. In the deep-seated diverticula its value in making a diagnosis is slight. Transillumination has also been employed, but with limited success. In the sound we have a means of examination, if properly employed, that will permit of a nearly certain diagnosis. In many cases upon attempting to pass a moderate-sized or small sound we find it meets with an obstruction which first appears to occlude the esophagus completely. Often in changing the position of the patient, as

by throwing the head far back or to one side, the obstruction is easily overcome, and the sound passes into the stomach unhindered. In other cases, as in one of ours, we may not be able to pass a small or moderate-sized sound, while a large-sized sound will easily slip through. In still another class of cases at certain times all sizes may be passed with ease, while at other times neither large nor small sounds can be introduced.

Rumpel has made use of two stomach-tubes to differentiate between diverticulum and dilatation. This method, as improved by Jung, offers the best means, when carefully employed, of recognizing diverticula, particularly those of the lower end of the esophagus. Rumpel employed two tubes—one, with numerous perforations in its lower end, is passed directly into the stomach; the other, with but a single opening at the end, into the esophagus above the cardia. Water, if poured through the second tube, will run down into the stomach through the opening in the first in case of dilatation. If a diverticulum exists, it will first be filled; and if the overflow will reach the stomach, the contents of the diverticulum can be returned to the second tube and measured.

The chief obstacle to this procedure is the introduction of the first tube into the stomach. In some cases of diverticula this is impossible, and in extreme cases of dilatation it is frequently difficult. Jung employs two tubes in the same manner as Rumpel. In addition, he introduces a third smaller tube, with only two perforations at the end, through the first or stomach-tube. By this means he is able to aspirate the fluid from the stomach, which gives positive information as to the position of the tube. With Rumpel's perforated tubes alone no fluid can be withdrawn from the stomach, thus making it impossible to ascertain definitely if the stomach has been entered. By allowing clear water to pass into the stomach through the first tube and a colored solution through the second, and by having the water returned unmixd with the colored solution from the inner or third tube, a positive diagnosis of diverticulum can be made, and dilatation of the esophagus with or without cardiac spasm can be excluded.

In non-malignant stricture of the esophagus, if a sound be passed into the strictured zone, no mobility of the sound is possible; while in a diverticulum, if the sound be passed into the sac, although it cannot be pushed farther down, a considerable degree of lateral mobility is possible. This procedure is sufficient to differentiate simple stricture from diverticula.

**Treatment.**—Palliative treatment consists in the use of daily lavage of the sac; astringent injections are indicated only in cases where the diverticulum is inaccessible or when for any other reason an operation is contraindicated. In a case that has been under my observation from time to time for twenty-four years the patient has learned how to empty the sac and to cleanse it by lavage daily. In this instance although the sac is very large after it is filled it does not completely obstruct the esophagus. The patient, an intelligent man, manages to keep in fairly good health. Every night before retiring he empties the sac and flushes it out through a small stomach-tube. He has always refused an operation.

The rational treatment of all pulsion diverticula at the pharyngo-esophageal juncture is essentially surgical.

Two methods of dealing with the sac have been employed:

1. Invagination of the sac into the esophagus and closure of the inverted orifice by purse-string suture—the method of Girard. This method should only be used when the sac is small—not larger than the terminal phalanx of the thumb.

2. Isolation of the sac and excision, with closure of the wound in the esophagus by suture.

This operation is best performed in two sittings, as first practised by me. At the first, the sac is exposed through an incision parallel to the anterior border of the sternomastoid, extending from the upper level of the larynx to the sternoclavicular articulation (Fig. 230, 3). By dull dissection the esophagus is reached. The only structures of importance that need be divided are the external jugular vein, the middle thyroid veins, and the superior thyroid artery and vein. The thyroid body is displaced inward, while the neck of the sac is sought for at the level of the cricoid cartilage. Identification of the sac is facilitated



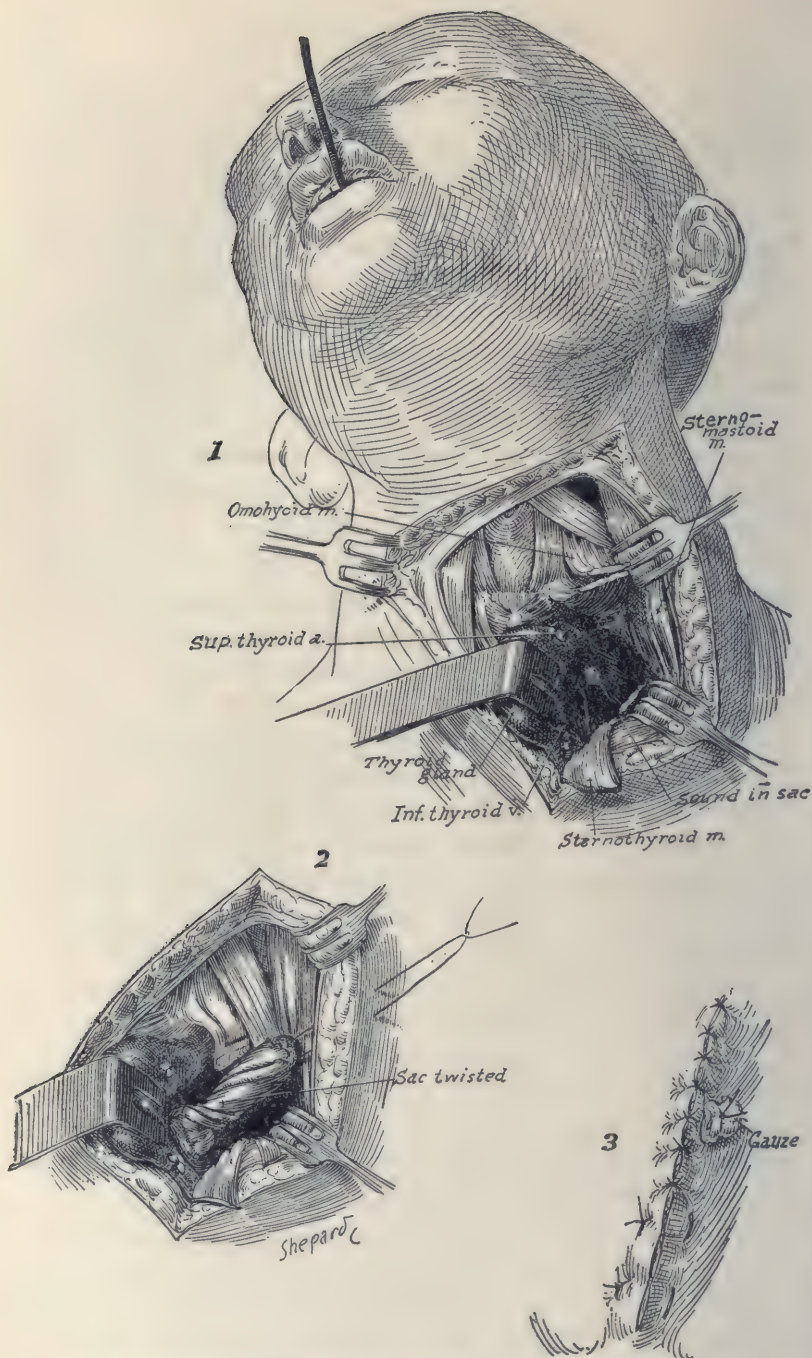


Fig. 231.—Diverticulum of esophagus. First stage of operation.

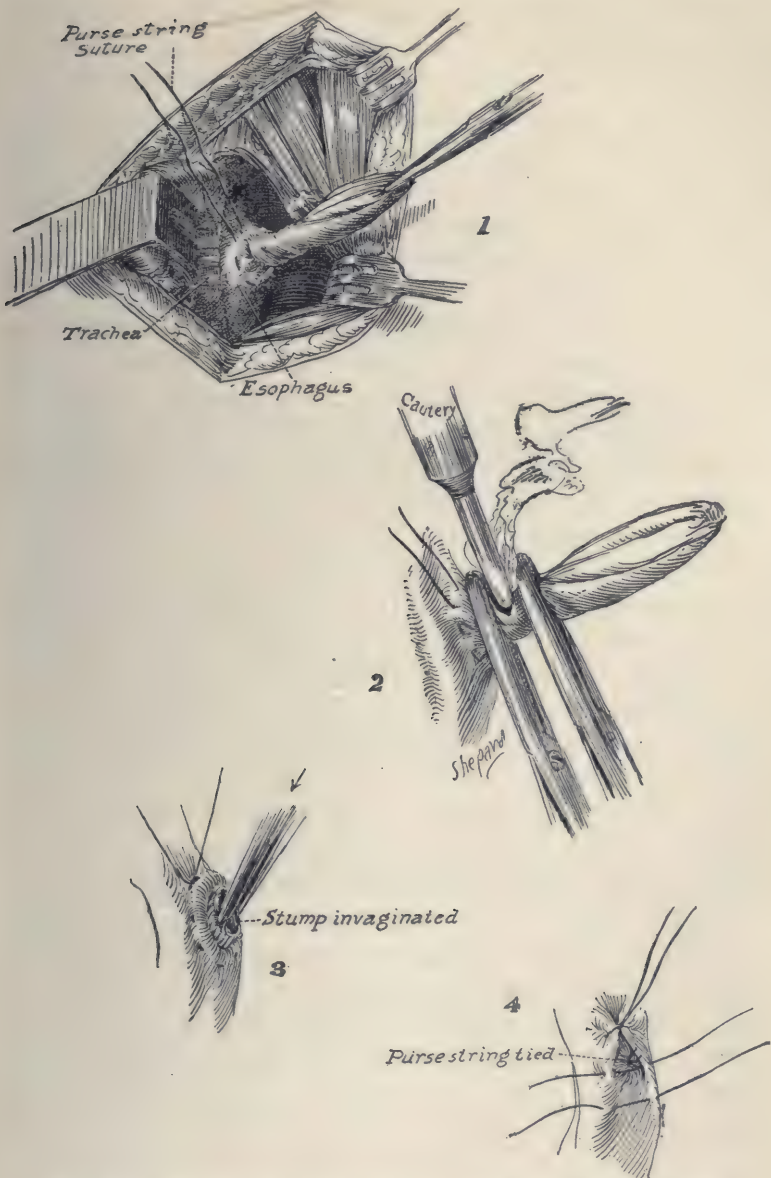


Fig. 232.—Diverticulum of esophagus. Second stage of operation.

by introducing an esophageal bougie into the sac (Fig. 231, 1). The sac is separated from the loose connective tissue of the

prevertebral space through dull dissection. This is generally easy of accomplishment. It is then drawn out into the wound, twisted on its transverse axis, and fixed by suture to the skin at the upper angle of the wound (Fig. 231, 2). The bed of the sac is packed with gauze. The skin, except at the point where the sac is fastened, is closed by suture (Fig. 231, 3). After four or five days the gauze packing is removed.

After this step the patient may be fed without any difficulty. No obstruction to swallowing will be experienced.

After one week or ten days we perform the *second step*. The wound is reopened, the sac is grasped, and the granulating edges of the wound separated until the neck is exposed. Around the neck a purse-string suture of Pagenstecher linen or chromicized catgut is passed, but not tied (Fig. 232, 1). The neck is clamped between two forceps and cut through between the forceps with a cautery knife (Fig. 232, 2). The forceps next to the esophagus are removed and the neck invaginated and the purse-string suture tied (Fig. 232, 3). This act is much like the common method of treating the stump of an appendix. The purse-string suture is reinforced by two or three interrupted sutures placed through the muscular wall of the esophagus (Fig. 232, 4). A gauze drain is placed down to the point of suture and the wound closed.

The advantages of this method are apparent. The high mortality that has followed excision of diverticula has been largely due to infection from the opened esophagus, of the loose connective tissue of the prevertebral space and the posterior mediastinum. When the esophagus is opened after this space is closed off by granulations the danger from infection is practically eliminated. In case a fistula does develop through cutting through of the sutures, it is a comparatively unimportant event. Closure within two or three weeks at most may be expected.



CLINIC OF DR. KARL A. MEYER AND  
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VOLVULUS

*Summary:* Tuberculosis of the peritoneum, with tabes mesentericus and chronic mesenteritis, producing volvulus of the ileum. Relative frequency of volvulus of the sigmoid and of volvulus of the small bowel—types of volvulus. Pathogenesis—spontaneous restitution—clinical picture—treatment.

*History.*—P. S., a male Austrian, age thirty-two, entered the surgical services of Dr. D. N. Eisendrath with a diagnosis of intestinal obstruction. He complained at that time of severe colicky pain in the abdomen, nausea and vomiting, and inability to have a bowel movement. For a period of several months preceding there had been considerable weakness, loss of weight, night-sweats, and a daily afternoon rise in temperature. The present attack started four days previous to admission to the hospital. The first symptom was pain, beginning abruptly in the left lower quadrant, constantly present, with colicky exacerbations. After several hours the pain gradually became diffuse over the abdomen and remained so. Vomiting began later on the day of onset, and thereafter occurred several times a day, with expulsion of large quantities of watery vomitus of non-offensive odor. There has not been a normal bowel movement since the onset.

During the past six months the patient has had night-sweats, afternoon fever, marked weakness, and has lost 25 pounds in weight in spite of sanitarium treatment for tuberculosis during that time.

Habits, family, and personal history were negative.

*Physical Findings.*—Patient entered the ward in a condition of severe shock. The facial expression was anxious and drawn, skin cold and clammy with perspiration. The pulse was rapid, weak, and thready; respiration rapid and shallow, and temperature subnormal. Examination of the head and neck revealed no other significant findings. Evidence of recent active tuberculosis was found in the chest. There was generalized rigidity and extreme distention of the entire abdomen, most marked in the left lower quadrant. Tenderness was general, but more acute on the left side of the abdomen. Shifting dullness was present in the flank. There were no other physical findings of any special significance.

The laboratory findings were negative.

*Diagnosis.*—The clinical picture is evidently one of ileus. With the evidence of pulmonary tuberculosis it seems probable that we may also find a fibrous tubercular peritonitis, with an obstruction of the bowel probably due to adhesions.

*Operation.*—We open the abdomen through a midline incision below the umbilicus. As the peritoneum is incised, a bloody fluid escapes. The peritoneal surfaces which come into view are thickly studded with miliary tubercles, and the peritoneum is definitely edematous. Presenting in the left lower quadrant you can see a mass of greatly distended bowel of a dark gray to black color, which is dull and lusterless in appearance. As we unfold this mass you observe that we have about 6 feet of gangrenous ileum, twisted on its mesenteric axis (Fig. 233). The root of the mesentery of this loop is markedly narrowed by thick scar tissue, and just above its vertebral attachment is a large mass of caseous lymph-nodes (*tabes mesentericus*), which produces a relative shortening of the mesentery of the next loop of the ileum. There is complete thrombosis of the vessels in this twisted mesentery. I shall proceed to resect this gangrenous bowel and do an end-to-end anastomosis by the usual technic. Especial care is necessary in packing off the field to avoid soiling the peritoneal cavity with the extremely toxic bowel content. We close the abdomen in the usual manner, without drainage. The patient is toxic and in severe shock

after four days of obstruction; the prognosis is necessarily grave. We shall combat the shock and toxemia as vigorously as possible by external heat, pushing fluids by proctoclysis, hypo-

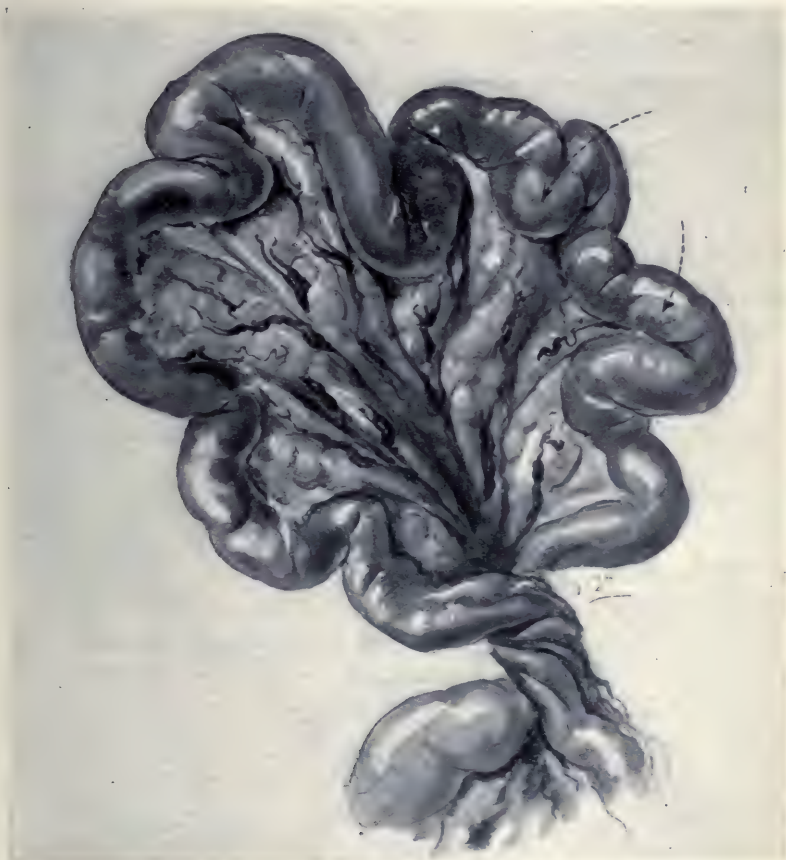


Fig. 233.—Volvulus. Loop of gangrenous bowel as unfolded at operation. Note how the pedicle of the mass is formed of intestine wrapped around the twisted root of an elongated section of the mesentery.

dermoclysis, and intravenously with epinephrin, together with pituitrin and other stimulation.

*Postoperative Course.*—The patient survived a very stormy period of four days following the operation, and improved



slowly thereafter, being able to leave the hospital on the forty-second day, to continue sanitarium treatment for tuberculosis.

This is an instance of the serous type of tuberculosis of the peritoneum, without adhesions between loops of bowel or between bowel and parietal peritoneum. The cicatrical contraction of the mesentery near its root, as met with at operation, is obviously a sequel of the chronic tuberculous process, and is of significance. By approximating the ends of the bowel loop a pedicle has been formed, which became twisted. There is no marked elongation of the bowel or its mesentery.

A volvulus of the small bowel about its mesenteric axis, independently of adhesions, bands, or hernia through internal apertures, is of very infrequent occurrence. Treves in 1883 was able to find only 10 recorded instances of this sort, in 7 of which the volvulus was in the lower ileum. In 2 of these cases there were recurrent attacks of partial obstruction at varying intervals before the fatal acute obstruction. These occurrences suggest that when the amount of rotation is less than 180 degrees, and the obstruction only partial, temporary relief may occur spontaneously, with the probability that the same causes, unless corrected, will again produce torsion of the bowel. If this is the case, there must be certain factors responsible for maintaining a volvulus once it has taken place, a phase of the question which we shall presently discuss.

According to Nicholas Senn, Leichtenstern, in an analysis of a series of 1541 cases of intestinal obstruction of all types, found 76 instances of volvulus, 45 of which occurred in the sigmoid flexure, 23 in the ileum, and 8 in the jejuno-ileum. Volvulus, in this large series of cases, has produced 5 per cent. approximately of all the obstructions. Most authorities ascribe a higher percentage of obstructions to volvulus, perhaps because in obstructions by bands, adhesions, kinks, strangulation through apertures, and similar mechanical obstructions, volvulus is a frequent concomitant finding, in the small bowel particularly. As to the regions of the bowel in which volvulus is commonest, the sigmoid flexure is, according to most authorities, involved in at least 60 to 80 per cent. of cases.

The rotation of a loop of bowel about its mesenteric axis, which is the most usual type of volvulus, can only occur when the loop in question is very long, with a correspondingly long mesentery, or when there is marked narrowing of the mesentery at its root, with approximation of the ends of the loop, forming a pedicle. Both of these anatomic conditions may coexist. In vegetarian races, particularly the Russian peasants, as stated by Küttner, the intestinal tract is much elongated, and volvulus is of more frequent occurrence among these people than the other Continental races. Elongation of parts of the mesentery and its loop of bowel may be congenital or acquired. Volvulus occurs nearly always in adults over forty years of age, which indicates that the anatomic conditions mentioned are probably acquired much more often than congenital. Chronic constipation produces this acquired change, especially in the mesosigmoid, which is dragged upon and stretched by a heavy, atonic, sigmoid loop, distended by feces and flatus. The length of the bowel itself undergoes a permanent increase because of the chronic state of distention, and the ends of the flexure are approximated at the root of its mesentery. Acute distention with consequent lengthening of the intestine, as seen in peritonitis or other causes of paralytic ileus, or distention from mechanical obstruction of other types, produces a condition favoring volvulus in the same way by disturbing the relation between the length of a loop and its fixed points of attachment.

Changes of this type in the ileum are often produced by incarceration or strangulation of a loop in an external hernia, with permanent narrowing of the mesentery at the ends of the loop.

Cicatricial contraction of the mesentery, with narrowing at its root, produced by chronic peritonitis or mesenteritis, without change in length of bowel or mesentery, is an infrequent predisposing cause of volvulus. Our patient furnishes an instance of this condition.

We often find volvulus where a portion of the bowel is fixed to the abdominal wall by adhesions. In these instances the volvulus is usually secondary and situated above the primary obstruction at the site of the adhesions.

The exciting causes of volvulus include exaggerated peristalsis, irregular peristalsis, and unequal distribution of intestinal contents. Posture is sometimes a factor in producing a twist, where a localized collection of material has weighted a short segment of bowel, the remainder of the same loop being empty or nearly so. These causes are practically incapable of producing volvulus, especially persistent volvulus, in the absence of predisposing factors, which has been demonstrated by Henning, who ligated at different levels the intestines of animals, and distended the proximal portion with water. Elongated loops of small bowel tended to rotate, but in the large bowel, where the mesocolon was short, rupture occurred in advance of any tendency to produce volvulus.

Two cases of volvulus associated with the passage of large gall-stones through the small bowel have been reported by Mayo-Robson, the volvulus being attributed to excessive peristalsis. These occurrences are somewhat analogous to the volvulus produced above a partial obstruction of the bowel due to organic stricture by means of excessive peristalsis in a distended elongated loop. With a bowel and mesentery normal as to length and attachments, there is a strong tendency to spontaneous reposition of loops twisted on the mesenteric axis, as shown by Senn, who rotated loops of bowel in animals and sutured them in position. Sufficient yielding of sutures and adhesions always occurred to prevent obstruction.

On the other hand, when the rotated bowel and its mesentery are long, or have a narrow pedicle, dynamic ileus rapidly occurs, precluding, as a rule, any spontaneous release of the twist. The length of the obstructed loop causes it to drop toward the pelvis, with further obstruction to the circulation. Distention of the loop and the counterpressure exerted by the abdominal wall maintains the twisted position. Intra-abdominal pressure is further increased by distention of the bowel above the obstruction, which is often an additional obstacle to any possible spontaneous replacement.

For the purposes of this discussion we need not concern



ourselves with the other types of volvulus further than to mention them in passing. Rotation of the bowel about its own axis occurs very rarely, and then only in the cecum or colon. Various types of knotting of loops of bowel, or rotation of one loop about another as an axis, are not common by any means as independent causes of obstruction, and the factors involved are very similar to those we have discussed.

Clinically, volvulus may present acute, subacute, or chronic symptoms, according to the degree and location of the obstruction. Rotation of 180 degrees or more will produce complete obstruction, with strangulation and acute symptoms. As in all forms of obstruction, the severity and urgency of symptoms increase as the location of the lesion approaches the oral end of the alimentary tract. I wish to emphasize those features of the clinical picture in volvulus which are to some extent characteristic of this type of obstruction. Vomiting is, in general, a less prominent feature than it is in other types of intestinal obstruction. In volvulus of the small bowel vomiting usually begins early, but is likely to occur at relatively long intervals and in large quantities. When the lesion affects the sigmoid flexure vomiting often begins late, is usually not severe, and in a few cases has been entirely absent, but eructations are frequent. Temesmus is often present in volvulus of the sigmoid and may be severe. Pain is the first symptom practically always, and, though well marked, often lacks extreme severity. Distention of the abdomen is extreme and usually develops rapidly. Early in the course it may be localized to the lower portion of the abdomen or one of the lower quadrants.

Volvulus with partial obstruction gives rise to subacute or chronic manifestations, characterized by recurrent attacks with mild obstructive symptoms, which continue until in some attack a complete obstruction occurs with acute symptoms.

The necessity for early laparotomy in all varieties of intestinal obstruction applies with equal force to volvulus. Senn advocates evacuation of the bowel contents by incision when extreme and general distention is present, followed by irrigation

of the lumen and suture of the bowel wall. He also emphasizes the importance of eviscerating the rotated loop before attempting to disengage the twisted portion, and of shortening the affected mesentery by a fold or tuck properly anchored by sutures, in order to forestall recurrence.

## CLINIC OF DR. ALBERT J. OCHSNER

### AUGUSTANA HOSPITAL

#### UMBILICAL HERNIA

*Summary:* A patient presenting cervical polyps and an incarcerated umbilical hernia; removal of polyps with cautery; technic of the Mayo operation for umbilical hernia—exact method of inserting sutures.

THE patient is a married woman, sixty-six years of age. She has a swelling at the navel which has been present for years. She has a good deal of pain over the navel if she does not take cathartics. Her past history is negative. She has some edema of the lower extremities.

The general physical examination is negative. There is a mass the size of a large orange in the region of the umbilicus; no other masses or areas of tenderness; no rigidity. There are two masses the size of walnuts, pedunculated, attached to the cervix uteri at the external os.

These two polypi are removed from the cervix, one from the anterior lip and one from the posterior, each  $2\frac{1}{2}$  x 2 cm. in diameter, and attached to a pedicle  $\frac{1}{2}$  cm. in diameter and 3 cm. long. The pedicle of each polyp is grasped by means of a clamp, including the mucous membrane of the cervix at the point of attachment. These clamps are tightly closed and then the pedicle is separated by means of the electric cautery, care being taken to thoroughly char the portions grasped by the forceps in order to seal the blood-vessels contained (Fig. 234). In this manner the hemorrhage will be prevented without the necessity of applying a ligature or suture. When the eschar becomes separated the mucous membrane will be healed smoothly, so that no defect will remain.

In the case of pedunculated intra-uterine polyps the same method is employed, the forceps being passed up into the cervix



of the uterus, grasping the pedicle in the same manner. The narrow blade of the electric cautery is passed up into the cervix



Fig. 234.—Removal of cervical polyp with clamp and cautery.

of the uterus for the purpose of severing the pedicle, the opposite side of the uterine canal being protected by means of a spatula.

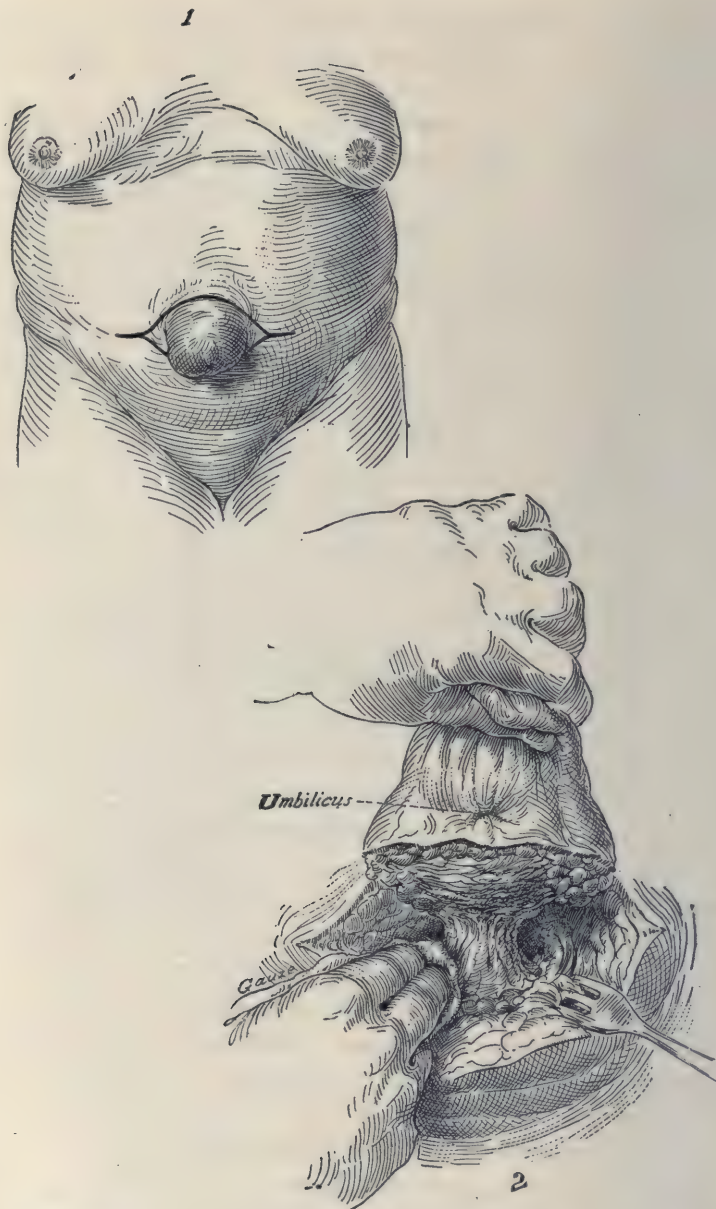
#### INCARCERATED UMBILICAL HERNIA

The mass in the region of the umbilicus in this case is stationary. Pressure has no effect upon the size or shape of this mass, which moves freely with the abdominal wall, but cannot be moved independently. It is an incarcerated umbilical her-

nia containing omentum and possibly a small portion of the transverse colon, judging from the fact that the patient has been suffering from intestinal stasis (Fig. 235, 1).

In operating upon these umbilical hernias we invariably follow the method which was introduced by Dr. W. J. Mayo, which consists in making an elliptic incision of the skin overlying the hernia, with its greater length extending from side to side; in this manner the sac and its contents are exposed. If you approach the operation in an unsystematic way, cutting a little here and a little there, you can easily waste an hour or more before you have the whole sac removed, and in the meantime you may injure the intestine or the omentum that is contained in the hernial sac, but, on the other hand, if you proceed systematically, picking up one edge of the sac and here open the peritoneum, and then go step by step along the edge of the sac, it will take but a few minutes and the entire operation is completed, so far as removal of the sac is concerned.

You see this abdomen is long from above downward and short from side to side. That is the principle we make use of in this operation. We make an elliptic transverse incision and then perform the Mayo operation. The difference between the Mayo operation and the one introduced by Joseph Blake lies in the fact that the former makes his union from above downward and Blake overlaps and sutures the edges of the wound from side to side. He does not take advantage of the fact that these cases have too much length from above downward and too little length from side to side, and, consequently, after the operation in which he makes the incision from above downward, the patient is uncomfortable because the tissues are constantly on tension, and because the tissues which are already shortened have become more shortened by the steps of the operation because they overlap from side to side. On the other hand, by making a transverse closure and overlapping the edges so that the upper edge lies underneath the lower one, or vice versa, you take advantage of the conditions found, and in that way the tissues are not on tension, and the patient is perfectly comfortable and can sit up in bed directly after the operation has been



Tom Jones

Fig. 235.—1, Hernia at umbilicus; line of incision. 2, The hernial sac dissected free to its junction with parietal peritoneum.



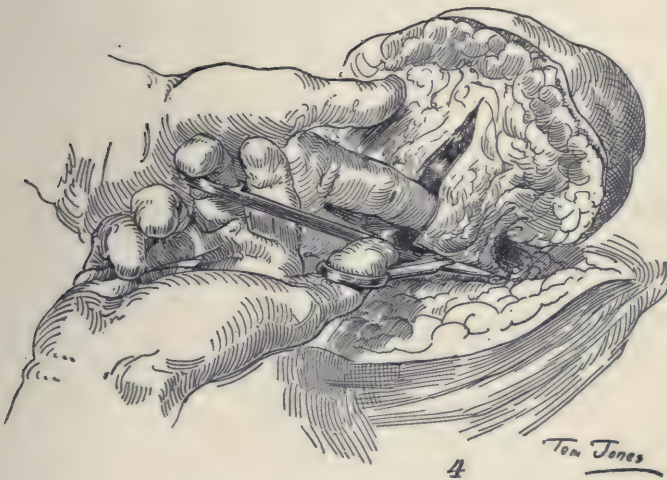
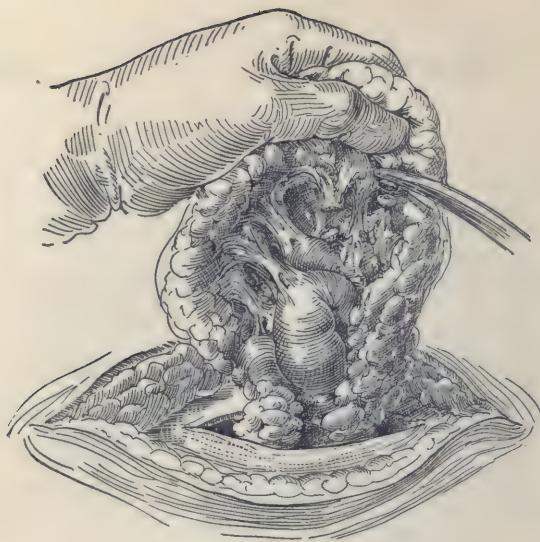
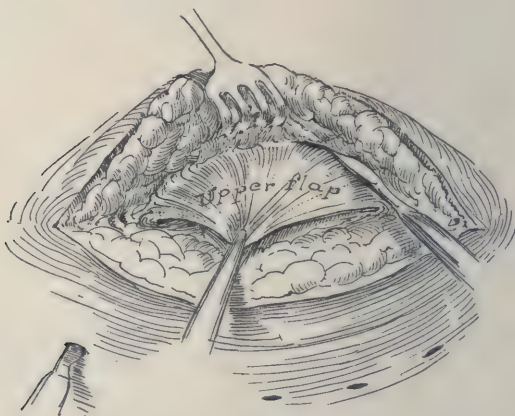


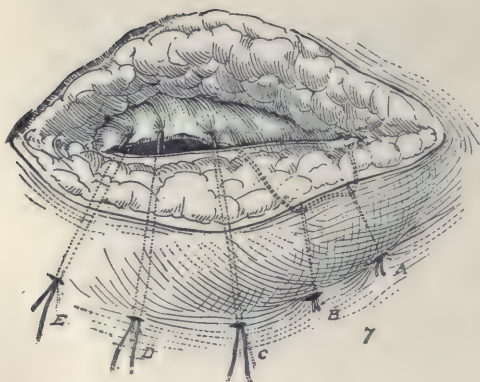
Fig. 236.—3, Incision into the sac exposing contents. 4, The sac is cut off at neck, while the fingers of the left hand protect the sac contents.



5



6



7

Tom Jones -

completed without any danger of causing tension upon the wound. We urge these patients to sit up at once, because they are usually fat, and, consequently, the possibility of a hypostatic pneumonia is increased if they are permitted to lie in bed in the horizontal position after the operation.

You see how carefully I dissect down to the aponeurosis, exposing the sac with its contents (Fig. 235, 2). The sac is 15 cm. wide from side to side, 12 cm. from above downward, and 8 cm. vertically. We have opened one little point here where the sac joined the abdominal wall, and you see that the former contains omentum. The assistant places his finger in the opening. Then I cut the peritoneum and transversalis fascia composing the hernial sac step by step. Ordinarily this can be accomplished most conveniently by placing a sharp-toothed retractor in the edge of the abdominal wound and having this held tense by the assistant, while the left hand of the operator makes traction upon the hernial sac together with its contents. This will catch the edge of the neck of the sac at the point at which it joins the abdominal wall, conveniently exposing it to be cut by means of a sharp scissors or scalpel. The entire process of cutting the neck of the sac in its complete circumference requires but a few moments (Fig. 236, 3 and 4). Then the finger is inserted between the sac wall and the contents of the sac at the most convenient point and the sac is split in a vertical direction. In this manner it is possible to dissect the contents of the hernial sac without the slightest danger. Aside from the omentum the sac contains a small piece of fat which is also removed. In order to replace this omentum I must enlarge this hernial incision. The omentum is retained in the hernial sac by means of several strands, all of which are

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Fig. 237.—5, The sac everted, showing adhesions of omentum and jejunum which are being severed and ligated. 6, The upper flap of peritoneum and transversalis muscle (combined) being freed from the subcutaneous fat. Five stab incisions have been made through the skin inferior to the lower edge of the wound. 7, Stitches being passed into the stab incisions and directly through the entire abdominal wall, catching the lower edge of the upper flap, and returning along the same route. Stitches *A* and *B* have been tied, thus pulling the upper flap beneath the lower.



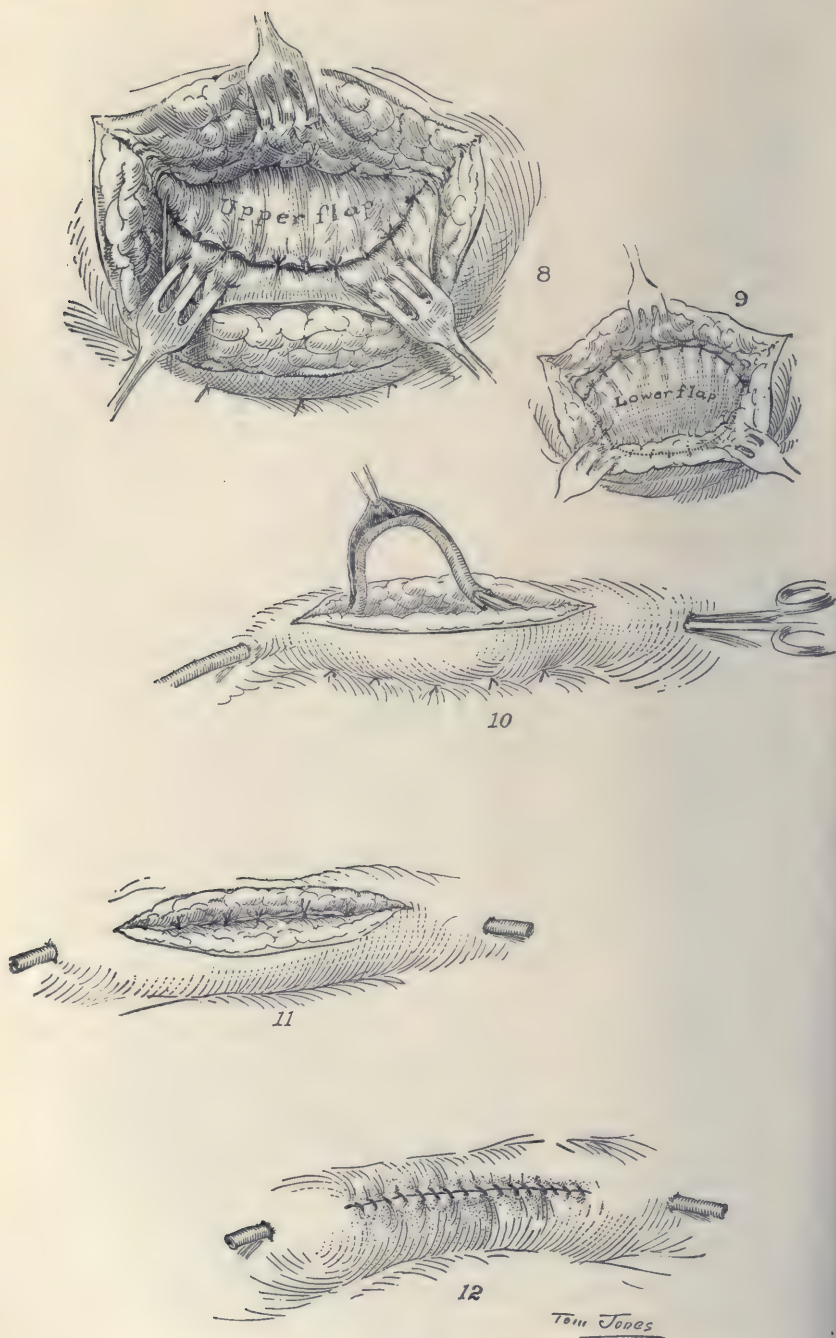


Fig. 238.

caught in the forceps, cut, and ligated (Fig. 237, 5). It takes but a few minutes to ligate the omentum and dispose of the sac. Now this step is completed, and I shall examine the gall-bladder, because a large proportion of these cases have gall-stones. She does not happen to have any. The uterus is in the normal position. She has a small, normal appendix. Consequently, nothing further needs to be done.

I now proceed to close this wound. In order to close it so that it will stay closed permanently we make sure that we have the flap properly arranged. I examine the flap above and find there is a lot of fatty tissue upon its under surface, and consequently it would be better to slide our flap from above downward. I examine the lower flap on the inside and find that it is composed throughout of solid, hard tissue, so that we can be sure to have a good solid attachment there and will have no return of the hernia. I am shaving away every bit of fat and loose connective tissue from the upper surface of the upper flap, so that nothing may interfere with its becoming attached to the lower surface of the lower flap. We are now prepared to suture our flaps. We do this in the following manner: We first provide a number of little incisions in the skin, 5 cm. from the edge of the skin wound and  $2\frac{1}{2}$  cm. apart (Fig. 237, 6). I make five of these incisions. We then pass a needle through these openings and through the entire thickness of the abdominal wall, pick up the edge of the upper flap, and then return with the suture to the point from which we started (Fig. 237, 6). We repeat this with each successive suture. We apply this suture with very great care. We prefer to use chromicized catgut sutures, which will last at least thirty days, for this purpose. In this way we secure an accurate coaptation between the lower edge of the upper flap and the peritoneum

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Fig. 238.—8, The edge of lower flap sharply retracted, exposing the line of suture, and an interrupted stitch applied between each of the five stay sutures. 9, The lower flap sutured above the upper, thus completing the imbrication. 10, A split rubber tube being inserted into the wound through a small wound at each end of the incision. 11, Subcutaneous stitches applied. 12, The skin sutured with horsehair.

and transversalis of the lower flap from 5 to 7 cm. from the upper edge of the lower flap, the amount of overlapping secured in this way depending upon the looseness of the abdominal wall. The greater the overlapping, the more satisfactory will be the closure of the hernial opening. In order to ensure absolutely accurate coaptation we insert a sharp retractor underneath the upper edge of the lower flap, the reinforcement and suturing of which has just been accomplished, and place interrupted sutures of fine chromicized catgut between the sutures that have already been tied, ensuring a perfect coaptation between the lower edge of the upper flap and the posterior surface of the lower flap (Fig. 238, 8). The lower flap is now swung up over the upper and accurately sutured in place by means of interrupted chromicized catgut sutures (Fig. 238, 9). In this way we are sure there will be no weakening and no recurrence. There is so much fat in this abdominal wall that there is bound to be some accumulation of free fat in this wound, and for this reason we will insert a drainage-tube (Fig. 238, 10). We place a few little catgut sutures in position to hold these flaps of fat together, but here we are even more careful than elsewhere not to use any pressure in tying the sutures (Fig. 238, 11). We simply bring the surfaces together, just enough to hold them. The circulation in this fatty tissue is slight, and so we must be careful of trauma. If we should draw these sutures too tightly we would be sure to produce trauma and wound healing would be retarded.

These hernias may protrude directly through the umbilical opening or they may protrude above or below the opening. In this case the hernia came out at a point a little above the umbilical opening. At the umbilical ring a very slight sac extended directly into the umbilical opening producing an additional, and, in this instance, a true umbilical hernia. This was clamped, ligated, and removed before undertaking the closure of the major opening.



## INTESTINAL FISTULA

*Summary:* A cecal fistula following suppurative appendicitis—digestion of abdominal wall by the escaping intestinal juices—treatment by feeding egg-albumen; technic of repair of fistula; after-treatment.

**History.**—The patient, a boy of nine years, was admitted to the hospital February 13, 1919. The mother states that three months ago the child had a ruptured appendix following influenza. Appendix was removed at this time, but the wound never healed. It has been dressed every day since. Sometimes bowels move through rectum, but usually from fistula in abdomen.

*Past History.*—Had influenza two months ago; otherwise negative.

*Family History.*—Negative.

*Examination* shows an anemic, undernourished individual, a child nine years of age, who presents himself on account of a fistula following a pus appendix. General examination is negative. Abdomen is of the flat type. There is an opening in the abdomen on the right side opposite the umbilicus, discharging feces. No masses, nodules, areas of tenderness, or rigidity are to be found.

When this patient came into the hospital three weeks ago an area 10 cm. in diameter of the skin of the abdomen surrounding this intestinal fistula consisted of a mass of red granulations. The skin had apparently all been eaten away. This fistula permitted the escape of pancreatic juices which ran over the edge of the wound. We see that frequently in duodenal fistula and also in case of drainage of the common bile-duct, where there is a large amount of pancreatic juice coming out through the wound. You will find sometimes that the entire abdomen is just one raw mass of granulations, and the suffering in these cases is so intense that the patient can hardly bear it. A good many years ago we found that by putting these patients altogether on a diet of egg-albumen—that is, the whites of two eggs

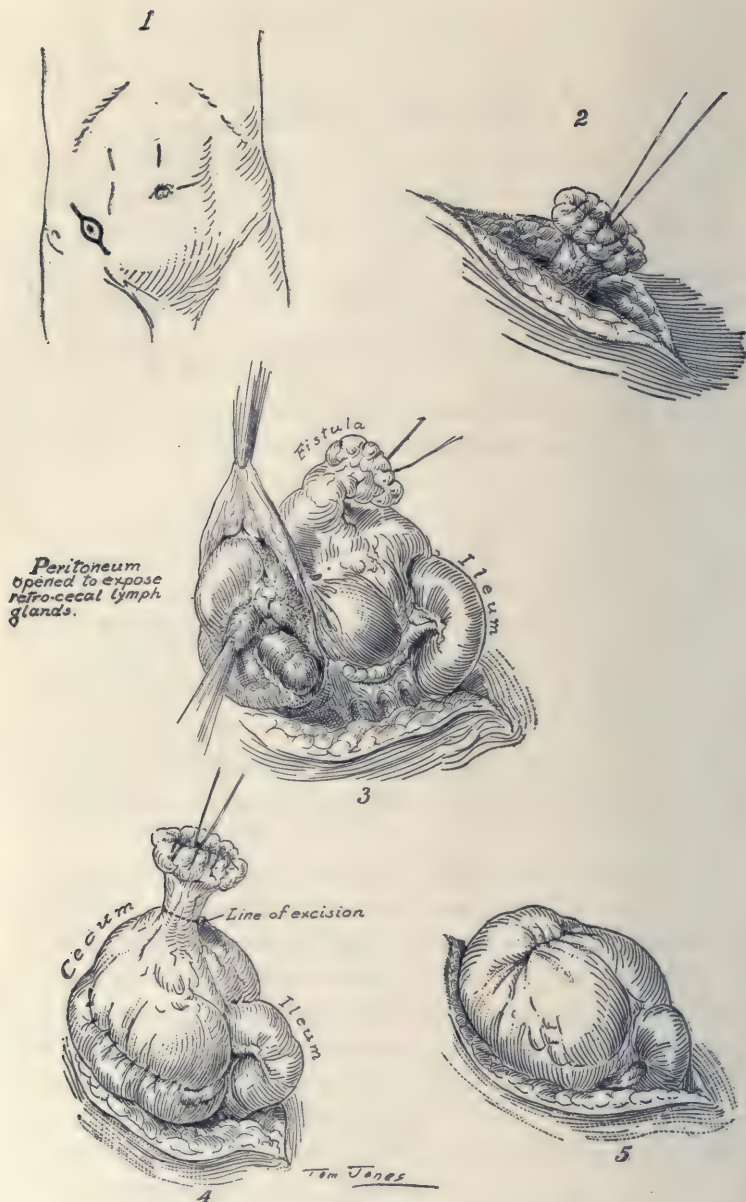


Fig. 239.

four times a day—within three days the surface will be healed. The egg-albumen takes up all of the irritating material and within three days the entire irritation will have subsided. Of course, in this child we could not give an egg-albumen diet constantly, but we had to give him other things at intervals of two or three days, but still you see this enormous area is perfectly healed. The child had an appendectomy performed about three months ago and the fistula was the sequel.

We will first make an incision around the fistula so as to secure a portion of skin that has not been infected (Fig. 239, 1). Now we will take some sutures and cover over this entire surface so that there can be no leakage during the operation. This step of the operation takes only a few moments, and it gives you a feeling of security. Now that we have this intestinal fistula closed, we will proceed with the operation (Fig. 239, 2). Our next step must be to make an incision without disturbing the first one we made. The fistula is on the anterior surface of the cecum, almost exactly opposite the point of entrance of the appendix into the cecum. All that is left of the appendix is a small portion  $1\frac{1}{2}$  cm. in length, comprising the distal portion of the original appendix, the remainder of the appendix and a portion of the anterior wall of the lower end of the cecum having sloughed away entirely at the time of the acute attack. The fistula resulting from the defect in the cecum was left after the slough had come away.

It is always best to enter the peritoneal cavity a little above or a little below the point at which the intestine containing the fistula is attached to the anterior abdominal wall in order not to injure this portion of the intestine. We can then pass a finger around the intestine within the abdominal wall and can carefully sever the adhesions between these two structures with-

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Fig. 239.—Intestinal fistula: 1, Fistula with line of incision; 2, fistula dissected free from abdominal wall and closed with sutures to prevent escape of contents; 3, cecum, ileum, and fistula brought out through abdominal wall. Note location of fistula on upper surface of cecum and the enlarged retrocecal lymph-glands; 4, peritoneum closed and fistula ready for excision; 5, stump of fistula inverted into cecum by purse-string suture and covered with several Lembert sutures.



out causing any injury to either. Having exposed the cecum, we lift it out of the abdominal wound, being very careful throughout the steps of the operation to sponge away any intestinal contents which may be forced out as a result of the manipulation. There is here a mass of enlarged retrocecal lymph-glands which I shall remove. They are easily exposed by an incision lateral to the cecum, and shell out very readily (Fig. 239, 3). I will close this incision without drainage. We are now ready to deal with the fistulous tract which we have exposed. I sever it at its junction with the cecum (Fig. 239, 4), remove the tissues thus released, and then place a few fine silk interrupted sutures through the edge of the wound in the intestine in order to adjust the edges in the direction in which healing seems most likely to occur without causing any constriction or obstruction. The edges of the intestinal wound having been adjusted, we place one fine silk interrupted suture 1 cm. beyond each end of the intestinal wound, and these sutures are held taut and left in place until the operation has been completed in order that no portion of the intestinal opening may be overlooked. The second row of interrupted silk sutures is then applied about 1 cm. apart. These sutures include the serous layer and the muscularis and submucous connective tissue, but they do not penetrate the lumen of the intestine, stopping short on the outer surface of the mucous membrane. The whole line of sutures is again inspected, and if any slight defect is discovered, this is overcome by the insertion of one or more fine interrupted silk sutures. We have been careful to avoid soiling of the wound or the peritoneum with intestinal contents, since it is not likely to be aseptic at as low a point as this in the intestine. By following this systematic plan of suturing we can be absolutely sure that after it has been completed there can be no defect and no leakage (Fig. 239, 5). The sutures have been placed with just sufficient firmness to secure accurate coaptation of the edges of the intestine and not with sufficient force to cause pressure necrosis. Unless the intestine containing the fistula, like the one before us, is entirely freed from its attachments to the abdominal wall, one does not usually succeed in obtaining permanent closure of the

defect. On the other hand, the operation which has just been demonstrated in this case practically always results in a complete and permanent closure.

**After-treatment.**—The patient's intestines having been thoroughly emptied before operation by the administration of 2 ounces of castor oil the day preceding the operation, there is no chance of gaseous distention or fermentation, and consequently the patient is likely to be very comfortable after this operation, and unless food is given by mouth there is neither any likelihood of postoperative gaseous distention nor of intestinal obstruction. We will consequently supply fluid nourishment to this patient by means of proctoclysis with the Murphy drip method, using 1 ounce of some concentrated, predigested food in 4 ounces of normal salt solution, given by a very slow drop method every four hours, and aside from this not to exceed 1 pint of normal salt solution is given by very slow drop method whenever the patient is suffering from hunger or thirst. On the third or fourth day the patient will be given beef-tea by mouth. On the following day broth or watery gruel, and these articles will be continued until about two weeks from the date of operation, when buttermilk and other liquids will be given. On the fifth day thereafter he will be given 1 ounce of colorless and tasteless castor oil in a little fruit juice or a little cream. In case there should be gaseous distention notwithstanding the precautions which have just been described, gastric lavage will be made at 105° F. after cocainizing the pharynx. This may be repeated several times if necessary, but usually it is not required because gaseous distention almost never occurs if this plan is employed.





## EXCISION OF COCCYX AND REPAIR OF VENTRAL HERNIA

*Summary:* Technic of excision of coccyx. Technic of repair of ventral hernias.

THE patient is a woman aged forty-three years. She comes to the hospital because of a tumor mass in the abdominal wall and pain over the coccyx.

She was operated on for a ruptured appendix in December, 1917. At that time the abdominal wound was drained. She was in bed for five weeks. Six months after operation the patient was operated on for a rupture in the old appendical scar. The patient now presents herself because of a bulging of a tumor mass which has appeared in the lower angle of the old laparotomy scar. She was operated on in June, 1918, through a low midline incision for suspected ectopic pregnancy, which was not found. She also complains of sharp neuralgic pains in the region of the coccyx. At times the pain is so severe that she almost faints. Past history is negative.

Physical examination shows an appendectomy scar, painful to examination. On standing or coughing, a globular mass appears at the lower end of the abdominal scar. The tumor mass is readily reducible.

This patient has a history, as shown, of intensely painful coccyx. In fact, she cannot sit down with comfort on an ordinary chair for a single moment. She is simply in terror, and upon our examining the coccyx yesterday she almost jumped off the table, it hurt her so.

We make this curved incision upward over the lower end of sacrum so as to keep away from the anus as far as possible. With this chisel we separate all the lateral attachments of the coccyx, lifting it out of its location and cutting the small connective-tissue bands which extend to the surrounding tissues. Then we place a piece of gauze into the space from which we

have lifted the coccyx, so as to control the hemorrhage for a moment, and by means of these large bone-cutting forceps we cut off the coccyx at its attachment to the sacrum. The coccyx is now entirely free except for its anterior and a few lateral attachments. With the same chisel we loosen all of the lateral and posterior attachments, which are quite solid, and therefore a little difficult to loosen. There is a little fragment of bone remaining which must be removed, because that might cause pain; this will leave a perfectly smooth end of the sacrum.

In order to leave the wound perfectly dry before suturing it we tampon it with dry gauze which is left in place for five to ten minutes. The surfaces are then brought together with fine interrupted catgut sutures applied with a short curved needle for the purpose of obliterating any dead space. The skin incision is crescent shaped, 6 cm. in length, with the convexity directed upward. This is accurately closed with fine horsehair sutures, attempting to secure absolutely perfect coaptation.

It is of the greatest importance to keep this wound clean in order to prevent infection because of its proximity to the anus, and consequently especial care must be taken in dressing this wound. We will place a separate dressing over the wound covered with vaselin. Then we will place a third dressing still farther down right next to the anus. In that way we hope to prevent the wound from becoming soiled. We will have the patient lie on her abdomen for the first four or five days until this wound is healed. The amount of relief she will get from this operation will be very great. By taking these precautions I am confident that we will have primary union.

The dressings are of the very greatest importance, and we fix them securely in position by placing a separate broad rubber adhesive strip over each one of the three individual dressings. In case one of these should be displaced, the other two are likely to protect the wound. Much time and trouble is saved both for the patient and for the surgeon if great care is taken in this particular. If you are shiftless about the primary or any subsequent dressing of this wound, it will cause the healing to be extremely slow and unsatisfactory, while if the above pre-

cautions are carefully carried out, one or two dressings will suffice to secure a perfect healing of this wound.

### VENTRAL HERNIA

This patient has also a ventral hernia and evidently some postoperative peritoneal adhesions for which she really came to obtain relief. When she stoops there is a bulging in the region of the abdominal scar and the adhesions distress her to a marked extent. We treat postoperative ventral hernia of this variety in the following ways: We expose all of the original layers, namely, the anterior layer of the fascial sheath of the rectus abdominis muscle, the muscle itself, and the posterior layer of the sheath of the rectus with the transversalis fascia and peritoneum throughout the length of the hernia. We have here omental adhesions to the old abdominal scar and the omentum has carried down with it the transverse colon. We dispose of this by clamping the adhesions with forceps, cutting, and ligating them. There is another adhesion at the very uppermost end of the old incision. Inspecting the original appendix operation, we find that there is nothing abnormal at this point. The gallbladder is also normal. The left ovary contains a cyst 4 cm. in diameter, which has a very thin wall and has ruptured on touching it with the hand. The right ovary also contains a small cyst, which I will open. It is a hemorrhagic cyst. Now I explore the cecum and find it free from adhesions. There are a few small adhesions between the omentum and the small intestine. The uterus contains a number of very small fibroids, so small that they are really of no importance. It would be impossible to remove them without removing the entire uterus, because they are distributed through all parts of the uterus proper. The uterus shows a tendency to tilt backward, so I will shorten the round ligaments somewhat by looping them over and suturing them to their normal attachments on the anterior surface of the uterus just in front of the attachment of the fallopian tubes. I place three chromicized catgut sutures on each side, so that I shall be sure the shortening will be permanent. If you apply only one suture, the shortening is liable



to disappear because the sutures will pull out. The round ligaments are strong in this case, so I am sure they will hold the uterus in its normal position. They are not intended to carry any weight, but will simply tilt the uterus forward.

We now have the uterus in its correct position, and we shall direct our attention toward the abdominal wall. The hernia is 5 cm. in length. At the lower end of the incision we might free all of the tissues of the abdominal wall, leaving the layers altogether behind the deep fascia, and then conveniently overlap those layers according to the method introduced by Joseph Blake some years ago if we chose to do that operation. In this case, however, the rectus abdominis muscle on each side is so nearly normal that it will not be necessary to imbricate as Blake did; we will simply lay bare the rectus abdominis muscle on each side and then carry our deep silkworm-gut sutures through all the layers down to the transversalis fascia and peritoneum, and leave them untied for the present while we suture each layer separately with fine catgut. It is well to divide the abdominal wall into four layers for the purpose of closing it, the deepest layer containing the transversalis fascia and the peritoneum, the next layer, the rectus abdominis muscle with all of its connective sheath, and the third and fourth layers—superficial fascia and skin. It is important in suturing these layers to use just enough force to bring the surfaces together and not enough to cause pressure necrosis. This greatly increases the comfort of the patient, reduces the likelihood of stitch abscesses, and secures a proper and satisfactory healing with a wound that will be free from the possibility of the development of a ventral hernia. Each layer is sutured with catgut except the skin, which we prefer to suture with horsehair. After all these layers have been sutured we tie the silkworm-gut sutures which have been left untied up to this time. They are tied just sufficiently tight to hold the surfaces together and protect the patient against separation of the wound in case of vomiting or coughing, but we are careful not to tie them tightly enough to cause pressure necrosis. In that way we can be absolutely certain that we will not have a recurrence of the hernia.

Suturing of these wounds is quite as important as the freeing of the edges so as to have each layer separate. We suture the peritoneum with fine catgut, because if you use heavy catgut you are liable to cause irritation of the peritoneum, which may result in adhesions. In suturing the peritoneum we are careful to turn the peritoneum outward so that no portion of the raw surface comes in contact with the intra-abdominal organs. We have arranged the omentum so it covers up the intestines and separates these from the abdominal wound. The peritoneal wound from the abdominal side is now absolutely smooth. There is not one particle of raw surface exposed. If one is in the habit of tying sutures tightly, then it will not be safe to apply separate sutures through the rectus muscle, because these muscles will not bear tight suturing. If, on the other hand, one ties the sutures only just tightly enough to bring the surfaces together, then this is an important layer, and this suturing will result in a very much more satisfactory wound than if you leave this layer to chance. We will place a few chromicized catgut sutures through the deep fascia, so that if the ordinary catgut should happen to absorb too quickly, the chromicized catgut will protect it.





## CLINIC OF DR. CARL BECK

### NORTH CHICAGO HOSPITAL

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#### EXTENSIVE OSTEOMYELITIS WITH NECROSIS OF THE TIBIA—RADICAL OPERATION

*Summary:* A patient with neglected osteomyelitis of the tibia—technic employed in the management of cases of this type; after-treatment.

THIS patient is thirteen years old. He is a miner's boy, referred by his doctor, who has been treating him for over a year on account of an affection of the right tibia. It started with fever and chills, and led to the formation of an abscess, which showed no tendency to heal. Several operations, consisting in incisions of abscesses and facilitating the discharge of small spicules of bone, were performed; the bone was scraped several times without avail, finally a large piece of bone made its appearance on the outside, but it shows no tendency to be extruded, and every motion of it causes pain. From different portions along the surface of the leg oozes thick, yellow, bloody pus (Fig. 240). The ankle region, compared with the other side, is considerably swollen and tender. The boy is pale and shows signs of his chronic suppuration, the urine, however, is still normal and does not show any of the characteristic signs of amyloid degeneration. The *x*-ray picture (Fig. 241) shows a very extensive osteomyelitis, leaving no doubt that the entire tibia from epiphysis to epiphysis is in a state of inflammation and partial necrosis. The treatment of these cases can only be one of a great deal of radicalism if any success is to be expected. It means nothing less than the removal of the entire diaphysis of the tibia, with the expectation that the periosteum which is left behind will form a new bone. The operation is performed in the following manner:

Under Esmarch constriction, so as to lose as little blood as possible, because the boy is anemic, we remove first the large

necrotic bone, sticking out from the wound, by prying the same loose at the bottom, and then scaping away all the granulating parts from the bone and soft tissues. This leaves a fairly clean surface, showing, however, that the bone is riddled with small abscesses and necrotic portions through and through. We



Fig. 240.—Extensive osteomyelitis with necrosis of tibia. Lesion before operation; noticeable features are: the necrotic bone projecting from the wound, the multiple discharging sinuses, and the swelling of the foot.

remove the periosteum bluntly on both sides, which is very easy, slip a Gigli saw underneath the tibia, and saw it through in the center, raise the lower and the upper fragment upward, and separate them from the periosteum. This is easily done, but toward the knee the separation becomes, of course, very difficult, since the periosteum is closely adherent and very thin,



Fig. 241.—Extensive osteomyelitis with necrosis of tibia.  $\alpha$ -Ray before operation; large sequestra are discernible in the center of the shaft, and at various points, especially toward the upper end, what appear like cloaca may be seen.



and here we have to bite out all the pathologic tissue with a Rongeur forceps. It is not very easy, and we have to go very close to the epiphyseal cartilage. We do the same thing in the ankle region, where the tibia is diseased clear down to the joint, and by scraping and biting out the diseased bone we finally have the whole area free. The picture (Fig. 232) shows the condition at this stage, the two clean surfaces indicate the inner surface of the periosteum of the tibia with the groove at the bottom where the posterior crest of the tibia was lying. Above

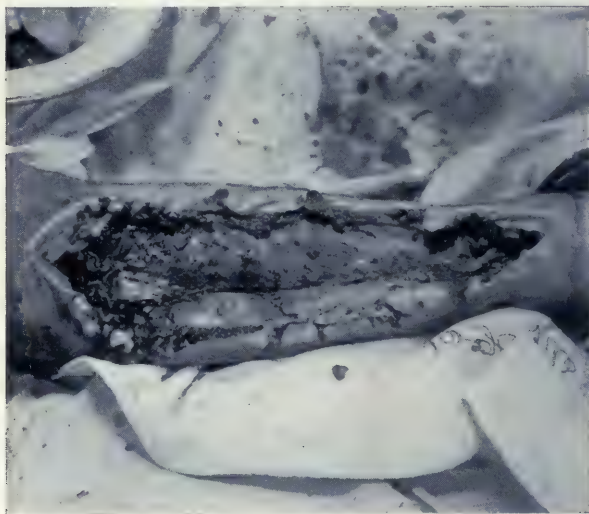


Fig. 242.—Extensive osteomyelitis with necrosis of tibia. At operation; all dead bone has been removed and the cavity in the leg laid widely open.

and below is shown clearly the surface of the bone which is healthy. On the sides one can see the ragged edges of the wound. We do not attempt to make this a clean incision, but just trim with the scissors the most ugly looking parts of granulatous tissue off, form two flaps, one which is like a tongue dipping down into the upper corner, and one like a tongue into the lower corner of the defect. We know that if we sew that together we shall not have healing on the upper and lower corner, consequently we sew together only the center part and

fix the flaps by sliding them into the cavity and pack the upper and lower corner. Then the leg is supported by a splint, inasmuch as the fibula forms the only support now, and it can easily be broken on account of the heavy weight of the foot, particularly if the child should be restless.

We expect that the periosteum in the center will form a new ledge of bone, which will afterward be quite a good support again, as a sort of tibia, as we have seen it happen in similar cases before. This is particularly true in younger individuals, who have a remarkable reconstructive power of bone after subperiosteal resection.

The after-treatment of these cases is very simple. Great care has to be taken that the suppurations are kept in check by cleaning very frequently a great amount of débris which comes especially from the upper and lower corner of the wound. It is only seldom that we have to deal with such extensive osteomyelitis requiring a total resection of the tibia. In most instances we can leave a thin ledge of the tibia which acts as a very good starting-point for bone formation.





## CARCINOMA OF THE UPPER EYELID

*Summary:* A patient presenting an ulcerating lesion of the upper lid of six months' duration; technic of removal and plastic repair of the lid; results.

THE next patient is a Greek, fifty years old, who for a half year or more has been suffering from an affection of his left upper lid, referred by Dr. S., who suspects either syphilis or tuberculosis. The left upper lid is covered by a granulomatous, ulcerated mass, which increases the size of the same consider-



Fig. 243.—Carcinoma of upper eyelid. Carcinoma of lid before operation.

ably and makes its motion difficult, although the muscles seem to be active. The borders of this ulcer are hard, irregular, and contain in some portions nodules which may be tubercles. Removal of one of the same and microscopic examination reveals an epithelial cell nest with a good deal of detritus. The inflammatory reaction is not very severe, there are no glandular



Fig. 244.—Carcinoma of upper eyelid. Defect in lid after removal of tumor filled by transplantation of pedicled flap from the forehead. Note that the lids are sutured together at the conclusion of the operation.

infections, and the patient has, outside of this affection, absolutely normal health. The growth has been rather slow, increasing very little day by day (Fig. 243).

There remain only two ways of treating which can be effective: one is the treatment with  $x$ -ray or radium, the other is surgical treatment, resection of the tumor and plastic reconstruction. The treatment with  $x$ -ray and radium, considering the neighborhood of the absolutely normal eye, seems to me a little risky, and I therefore choose the surgical method. Besides this, economic reasons prompt me to do rather a quick radical cure than the slower and expensive treatment of radium or  $x$ -ray. Under a general anesthetic the tumor is excised accurately within normal epithelium, and it is found that the muscle of the upper lid can to a certain degree be retained, so that we have hope of some physiologic action after plastic. This is an important matter, inasmuch as a stiff, immovable upper lid has the same effect as ptosis of the lid, and covers the otherwise normal bulbus so that the same becomes useless; while the operation performed in such a manner that the bulbus remains free, making the upper lid stationary during the period of the open eye, will allow no closure of the eye during sleep, and consequently a dryness of the cornea with subsequent ulceration. If it is therefore possible to retain activity of the upper lid, it is a great gain. The operation is performed in the following manner: A flap, taken from the region of the forehead above the eye, is swung around into the defect, leaving its contact at the base of the flap with good nutrition toward the temple region (Fig. 245).

In the removal of the carcinoma the border of the eyelid had to be removed, and with it the eyelashes. It is impossible to replace the same, and it is not advisable to make any attempt, inasmuch as hair brought over from some region, while it may be possible, will not grow in the same manner as normal eyelashes, but will grow toward the bulbus and cause discomfort similar to that of entropion with a normal lid border. I prefer therefore to have a lid border without any eyelashes. The conjunctiva of the upper and lower eyelid is sutured temporarily



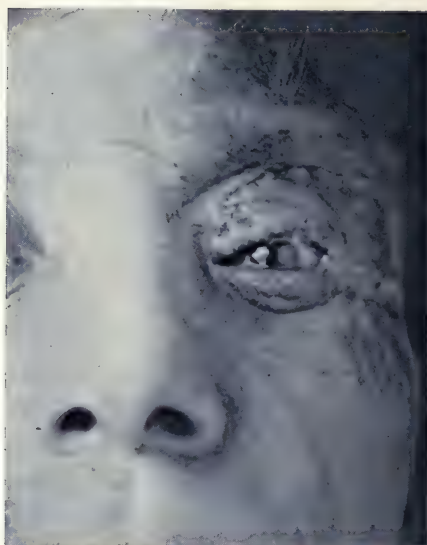


Fig. 245.—Carcinoma of upper eyelid. Degree of functional recovery at the present time.



Fig. 246.—Carcinoma of upper eyelid. Degree of functional recovery at the present time.

with three stitches so as to make the lid absolutely immovable during the healing process. The result is ideal, the eyelid re-



Fig. 247.—Carcinoma of upper eyelid. Degree of functional recovery at the present time.

constructed, normal, allows of motion upward and downward, and allows the man to open and close his eye almost like a normal eyelid (Figs. 245, 246, 247).





## WEBBED FINGERS

*Summary:* Technic of operation for syndactylism—the simplest procedure—tubulization of the web at the base—when applicable; marked scar tissue formation, as in present case, a contraindication; transplantation of skin from chest.

THIS fifteen-year-old girl has a congenital deformity of the type known as “webbed fingers.” When she was three years old this deformity was operated upon in an unsuccessful manner, with the result of scars between the fingers, instead of the freely movable scarless web. Affected on the left hand are only the last three fingers—a web up to the middle of the sec-



Fig. 248.—Webbed fingers. Patient before operation; note scar tissue in webs due to previous unsuccessful surgical interference.

ond and third phalanx, between the middle and fourth and between the fourth and the little fingers. On the right hand there is only one web between the middle and the fourth finger (Fig. 248). The girl is otherwise perfectly healthy. Motion is somewhat impaired. Not only can the fingers not be spread, but they are also not so flexible as they ought to be. The reason for the failure of operations of this kind is that all such separations of skin have a great tendency to heal in the same manner as before the operation unless there is a real plastic



Tom Jones

Fig. 249.

performed, which places skin, and flexible skin at that, at the base of the phalanges. If this patient had not been operated on before unsuccessfully we would do a very simple method which has proved to us universally very satisfactory and gives almost an ideal result. It can be done under local anesthesia provided there is sufficient material of skin constituting the web so that we can make that plastic. We cut, on the dorsal surface, a small flap of rectangular shape, with its base toward the wrist, and form a little tube out of it, and then slip this tube through a slit at the base of the web and sew its border exactly into the palmar surface. A rubber tube or a catheter around which this skin tube is formed facilitates greatly this maneuver. After a few days the catheters are removed and we find regular button-holes at the bottom of the web. After this the web is split with a stroke of the scissors clear down into the button-hole and either side secured by a few sutures, or even without sutures it will never grow to the other side.

This maneuver is only possible, however, if the web is very loose; it is not possible in cases of close adhesions or irregular synechia of the fingers, in which the bones with their coverings are closely joined with the bones of the other finger, a condition which is usually known under the term "syndactyly."

In this case we had to proceed therefore in a different manner. The scars had partly transformed the web into a rigid mass without elasticity. Fortunately for the patient, the doctor was not daring in making the incisions as low toward the metacarpal bones as they have to be made, and so we had at least that part of the skin at our disposal for plastic purposes. By making two triangular flaps, one on the dorsal and one on the palmar surface, with the base of the flap toward the wrist and the triangles as long as possible, we prepare our skin for the space between the fingers. The web is cut in the old scar and the scars resected from the soft tissues around them, the skin united along the fingers, and the two triangles placed so that their sides meet in the middle and their points reach into the

Fig. 249.—Webbed fingers. Diagrammatic presentation of operation as performed on patient in clinic.



opposite side, thus making a broad skin between the fingers (Fig. 249, 3A).

After having completed this operation between the middle and the fourth and the fourth and the last finger, we find, of course, that we have not enough skin on the little finger, having used most of the skin for the others, and it is necessary to cover



Fig. 250.—Webbed fingers. The flaps raised from the skin of the chest have been sutured over the denuded areas on the fingers. Note that the skin edges about the areas from which the flaps have been raised have been approximated; if this is not done at the time of the primary operation the discharge from the granulating surface may become a source of marked annoyance, while healing may be greatly delayed.

the defect of the little finger, on the inner side extending from the median line on the dorsal side to the median line on the palmar side and from the base of the finger to about the base of the first phalanx in length, a defect of about 2 inches by 1 inch in diameter, from somewhere else, and the best source is afforded by the skin of the opposite side of the chest. We therefore sew the finger to the chest in the way you see (Fig. 250),

a method which we use very frequently to cover defects on hands or fingers.

*Note.*—One week later this flap was cut at its broad base and sutured into the fourth side of the defect of the finger, the three sides having been sutured at the first operation, and the plastic was thus completed with an ideal result, restoring the fingers to normal state and function.

At this time the plastic on the other hand was performed in the same manner as on the left.





## CLINIC OF DR. GATEWOOD

### PRESBYTERIAN HOSPITAL

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#### DUODENAL ULCER

*Summary:* Difficulties occasionally encountered in differentiating acute cholecystitis, perforated duodenal ulcer, and acute pancreatitis; the surgical treatment of ulcer; importance of the after-care; outline of the post-operative management of ulcer cases.

THIS patient entered the hospital about three weeks ago with the following history:

For the last eighteen years she has had attacks of pain in the epigastrium which came on two to three hours after meals. These attacks would be relieved by food taking and by soda. She has been awakened at 2 o'clock in the morning. Such attacks would last from four to eight weeks, and then the patient would be entirely free for a similar period. At one time she had no distress for almost a year. About the time the trouble began she had a severe attack of pain in the right epigastric region, which was severe enough to require morphin for relief. There was no jaundice at this time, but the attending physician diagnosed gall-stones. Since then she has had no similar attack until three weeks ago, or the day before she entered the hospital. Not feeling very well on that day, she ate but little. She went to bed early in the evening, and about 1 A. M. was awakened by a severe pain in the region of the gall-bladder. This pain radiated to the back. It was severe enough to make her perspire freely, and the physician who was immediately called administered a hypodermic. She obtained partial relief two hours after the injection. The pain started again later in the morning and was diffuse over the entire abdomen. She vomited many times during the night and morning, but the vomiting ceased during the day. I first saw her about 6 o'clock in the afternoon,

at which time she was much more comfortable than she had been for several hours.

Examination revealed a fairly well-nourished woman in no great distress. The entire abdomen was very rigid, but the right side seemed much more so than the left. There was marked tenderness in the right hypochondrium, but she was so tender that accurate palpation was entirely out of the question. Her temperature was  $101^{\circ}$  F. and the leukocyte count was 19,600. I advised an immediate exploratory, the diagnosis resting between acute cholecystitis and perforated duodenal ulcer, with, of course, the possibility of an acute pancreatitis being taken into consideration. She refused operation until her husband came from a distant city, so palliative treatment was instituted, giving nothing by mouth; 8 ounces of normal salt solution were given every four hours by rectum.

At 11 o'clock the patient was still more comfortable. Her temperature had dropped to  $100.6^{\circ}$  F. and the leukocyte count was 17,500. Believing that she probably had an acute cholecystitis on account of the absence of signs of general peritonitis, and as her general condition seemed to be improving, I deemed it advisable to watch her for a few hours.

The following morning she seemed better, and operation was again delayed, believing now that the patient was suffering from cholelithiasis with cholecystitis. On account of the old history suggestive of ulcer and the possibility of a localized perforation, ulcer management was instituted. This consisted in starvation for twenty-four hours, or until positive that there was no leak into the free peritoneal cavity. During the starvation period and for the next three days she was given 8 ounces of normal salt solution per rectum every four hours. Given slowly with a small tube there is no difficulty, as a rule, in having the patient retain the fluid. Nutrient enemata might have been used, but our experience has been that most of them are somewhat irritating to the bowel, and as there was no immediate danger of starvation acidosis, salt solution was preferred.

Her temperature gradually subsided during the first week of management. On the seventh day it again reached  $100.8^{\circ}$  F.

and on the eighth day it was up to 102° F. Her abdomen had remained more or less tender during this entire time, particularly in the right upper quadrant. On the seventh day she called my attention to the fact that she was tender in the lower left quadrant of the abdomen, and I was able to make out a definite sense of resistance in the region of the sigmoid. Bimanual examination revealed a mass in the pelvis which was very firm and not very tender. My first impression was that this was a fibroid, but on going into the history carefully it seemed more like a well-defined abscess. Dr. Heaney saw her about this time in consultation and advised an exploration per vaginam with a trocar. This was done and a considerable quantity of pus found in the culdesac. This pus had no odor and did not appear to be gonorrheal or tuberculous. Microscopic examination of the pus showed staphylococci.

Her temperature came down to normal following drainage of the abscess and remained almost normal for the next ten days. As the tenderness throughout the abdomen gradually subsided, there still remained a marked tenderness in the right hypochondrium. I was able to distinctly make out a mass in this region about seven days after she came into the hospital. This mass varied in size from time to time, extending as far down as the umbilicus at times, but never entirely disappearing. It seemed to be oval in shape and remained quite tender. I therefore advised an exploratory operation, which we are making this morning, with the tentative diagnosis of hydrops of the gall-bladder following an acute attack of cholecystitis, probably with a cystic duct stone.

I am making the usual Bevan S-shaped incision. I find that the abdomen contains many firm fibrous adhesions, which I am carefully breaking up by blunt dissection. The stomach is firmly attached to the anterior abdominal wall and to the liver. I am now able to explore the gall-bladder, which is small, normal in color, and contains no stones. The tumor mass which I have been able to palpate is edematous omentum, in the center of which is probably a small abscess. The amount of inflammatory reaction in it accounts for the fluctuation in its size. The lower



right quadrant of the abdomen is free from adhesions. It is now evident that this patient had a perforation of a duodenal ulcer three weeks ago, and that the infection migrated across the upper abdomen and down the left side to the lower left quadrant without involving the entire abdominal cavity. To my mind this is a most unusual picture. I will remove the omentum which formed the mass after transfixing and ligating its pedicle.

The question now arises of how to treat the ulcer. As I separate the adhesions between the liver and duodenum I break the thin fibrous covering over the perforation. It is possible that the patient might have entirely recovered had accurate ulcer management been continued without operative interference. However, I feel that it is much safer to remove the ulcer, and I am now doing this by cutting it out with the electric cautery and inverting the raw edges with two rows of Lembert sutures. I have compromised the lumen of the duodenum so much in this closure that I fear obstructive symptoms may follow. It will be safer, therefore, to do a posterior gastro-enterostomy, which I am now doing by the old Billroth method (described by Dr. E. W. Andrews in the *Surgical Clinics of Chicago*, February, 1918, p. 1), using a short loop and making a three-row suture closure. The abdomen is closed without drainage.

I might stop for a moment to consider the indications for surgical therapy in gastric ulcer. There are probably relatively fewer cases operated upon in this clinic than in any other large clinic in the world. As a result of the careful clinical researches of Dr. B. W. Sippy we feel that the indications for operative interference are very definite. In the first place, of course, perforations are always surgical, and had our diagnosis been definitely made at the time this patient entered the hospital no delay would have been countenanced. Second, carcinoma suspects. If, either from a clinical or radiographic standpoint, there is good reason to suspect malignancy, the case should immediately be given the benefit of an exploration with the idea of a resection if at all possible. Third, pyloric obstructions which are not relieved after thorough management. Many obstructions are due to perigastritis; others are the result of spasm.

These obstructions will promptly disappear in the majority of cases if good medical management be instituted. Fourth, adhesions. Occasionally only do adhesions produce symptoms which demand operative interference, although I have seen them cause obstructive symptoms several times. Fifth, unmanageable cases. There are a certain number of patients who could be made well by medical management, but who are not willing to devote the necessary time and funds to it. Patients of this class can often be cured by resection of the ulcer.

What operative interference is to be recommended is still an unsettled question. However, there are some very definite indications for certain operations. For example, no one will question the wisdom of a gastro-enterostomy in a definite pyloric obstruction, nor of resection of the ulcer in suspected carcinoma cases. Since we have learned that gastro-enterostomies do not drain the stomach, we never do a gastro-enterostomy for an ulcer of the fundus or lesser curvature. Except in rare instances those cases should be treated by accurate medical management. I would except those old calloused ulcers of the greater curvature which had recurred after good management, especially in individuals who would not follow their management carefully. In such cases I believe excision should be done. Excision should also be done in cases of exploration for other conditions where the risk to the patient is not materially increased by getting rid of the ulcer. I cannot agree with those who urge resection or excision of all ulcers clinically demonstrable. Could we make examinations of the stomach at the operating table with a thoroughness equivalent to that made postmortem, removal of clinically demonstrable ulcers might be advisable; but, as such examinations are not possible, we are unable to locate many ulcers at operation, to say nothing of the increased risk to the patient incurred by operating, and the fact that many such ulcers can be cured by medical management.

I might take this case as an example of what seems to me to be necessary in the postoperative management of gastric or duodenal ulcer. I was considerably amazed not very long ago while visiting the clinic of one of the best men in this country to

hear a patient who had had a gastro-enterostomy two weeks previously for a duodenal ulcer say to the resident as she left that she still had the same pain which she had upon entering the hospital. His reply was: "That is all right, you will get over that by and by." When she further inquired as to what diet she should take he told her to eat everything. I believe that most surgeons are coming more and more to recognize that their work is not ended at the time the patient has recovered sufficiently to leave the hospital. In stomach cases particularly careful medical management should be instituted either by the surgeon or by an internist.

We shall feed this patient nothing for the next twenty-four hours and supply liquids by the rectum. At the end of that time we shall begin with water and give 1 to 2 ounces every hour, and on the second day we shall add equal parts of milk and cream, 1 ounce every hour. The quantity of milk and cream will gradually be increased to 3 ounces an hour on the third or fourth day and she will be allowed all the water she desires. Carbohydrates should be given early in all cases, and, therefore, about the third day we shall begin to feed her cereals, such as rice, farina, and strained oatmeal in 2- to 3-ounce quantities, with a moderate amount of sugar. This diet will be continued for approximately ten days. We shall then begin to give powders, as in the usual ulcer management. In this particular case we have not been able to ascertain her exact acidity because we have not felt that it was safe to aspirate. In the average case the exact amount of alkali necessary to neutralize the acid would have been determined before operation.

We shall give her a powder containing 30 grains of bicarbonate of soda and 10 grains of magnesii oxidum (ponderosum) every two hours midway between feedings. On the alternate hours she will be given 10 grains of calcium carbonate and 30 grains of bicarbonate of soda. Occasionally a patient is very susceptible to magnesia, and if diarrhea occurs the calcium powders are used in place of part of the magnesia powders. If constipation occurs the number of magnesia powders should be increased.



The diet will be gradually increased so that at the end of two weeks she will be getting three meals a day with three lunches between meals. These meals are in addition to the hourly feedings of milk and cream. During the third week we will feel safe in aspirating the patient, and her exact acidity will be determined and neutralized. The patient should be able to leave the hospital at the end of three weeks. At this time she will be given the following typewritten diet, which is essentially the ulcer management outlined by Dr. B. W. Sippy after years of experience with this type of stomach case:

"It is to be borne in mind in making out any ulcer diet that the function of the diet is to neutralize the acid formed in the stomach and to furnish nourishment to the patient. It has long been conceded that the hydrochloric acid is the potent factor in keeping an ulcer from healing. Of course, in addition to the acid factor, there is the mechanical element to be considered, *i. e.*, the passing of food over the raw spot. In general, the foods to be selected are those which are high in combining properties, and at the same time high in nutritive value. These foods should be easily assimilable. The best single food of this sort perhaps is cream, but as many people do not like it and it may cause some bowel disturbances it is usually mixed with an equal part of milk. This is the basis of the best ulcer diets. The oftener the patient is fed, the less acid accumulates, so that if the patient is to be treated ideally there will be no free acid in the stomach at any time during the day. Such a patient can have no discomfort from burning, and when burning is present one may be sure that the management is at fault somewhere.

"The following diet has been arranged with the above principles in view, and while it may require slight modification, it represents, in general, the diet to be followed. As it is impractical to feed sufficiently to neutralize all the acidity, powders of various alkalies are given midway between feedings.

"From now on a gain of a pound a week for a few weeks is to be desired. If this is not accomplished, larger quantities of the same food should be taken. It is desirable to continue the diet exactly as given in the hospital in the next two weeks, after which begin feeding of equal parts of milk and cream, 3 ounces, every hour, with six additional feedings, such as cereals, cream soups, custards, and purées, with a cracker or a small piece of toast. The powders are to be taken midway between feedings. After this time continue the feedings every two hours, doubling the amounts. The powders are to be doubled in quantity and taken midway between feedings as before. At the end of six weeks the length of time between feedings may be increased to three hours, but the patient should take five or six meals a day for the next six months. This can be readily accomplished by eating three regular meals with the family and taking a glass of milk and cream between meals when it is not possible to obtain a lunch. In event of distress at any time it is well

to return to the hourly feedings until the cause has been established. *There should be absolutely no stomach distress.*

"At all times avoid such foods as pickles, potato salad, fried potatoes, coarse vegetables, strong coffee, and highly seasoned foods of all kinds should be avoided.

"During a period of a year or more milk, cream, cereals, soft eggs in any form except hard-boiled or fried, vegetable purées, mashed potatoes, bread and butter, and a piece of well-cooked meat should form the basis of the diet."

The most essential part, to my mind, of the postoperative management is to make the patient your confidant and obtain his co-operation in the management. The reason for administering the powders is explained carefully to him and the powders are labeled so that he knows exactly what he is getting. This patient will be instructed to report to us each month either in person or by mail for the next six months to a year.

*Postscript.*—Three months after operation the patient reports that she has gained 12 pounds in weight, has no discomfort, and feels perfectly well.

## CLINIC OF DR. ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

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### OBSTRUCTION OF COMMON BILE-DUCT

*Summary:* A patient with silent jaundice giving a history of a gall-stone attack three years previously; difficulty of differentiating chronic pancreatitis, stone, and carcinoma. Operation—stones in common duct at junction with the cystic duct simulating an hour-glass gall-bladder with calculi; danger of grave injury to ducts in operations of this type; necessity of wide exposure and a deliberate, painstaking operative technic.

THE patient I shall operate this morning is a woman of fifty, who gives the following history:

Three years ago she had a severe attack of pain in the right upper quadrant of the abdomen, consistent, from her description and from the description of her attending physician, with being a gall-stone attack. This was followed by a mild temporary jaundice. She had no further trouble until about eighteen months ago, when without any pain or other symptoms she became jaundiced and remained so for four or five weeks. This finally cleared up. Six weeks ago she again—without any pain or other symptoms, such as chills or temperature—became jaundiced. She comes to us now very deeply jaundiced and with clay-colored stools. She has lost a good deal of weight and strength. Careful examination and thorough investigation fails to disclose any other facts. In other words, it is a silent jaundice, a jaundice coming on without any pain six weeks ago, which has persisted since that time. The case is one of a great many similar cases that we have dealt with in this clinic. My clinical diagnosis is not a definite one. I am inclined to believe that she has an obstruction of the common duct, and that this obstruction may be due to one of three things—gall-stones, chronic pancrea-



titis, or carcinoma of the pancreas. Because of the fact that three years ago she had an acute and definite attack of pain consistent with being gall-stone colic, I am inclined to believe that there is a chance of its being an obstruction due to gall-stones. It is, of course, quite possible that she has gall-stones plus a chronic pancreatitis, or that her attack three years ago was due to gall-stones, and since that time she has developed a carcinoma. After analyzing a large number of similar cases I feel that one is not warranted in attempting a definite diagnosis without doing an exploratory operation, and I have advised an exploratory with the idea of first making the diagnosis definite, and then, if the conditions found warrant it, removing the obstruction or instituting what seems to be the most appropriate surgical therapy. The patient's general condition is good. In spite of the jaundice her hemoglobin is above 70, and the time of coagulation of the blood is about four and one-half minutes. There is no heart lesion and no kidney lesion contraindicating a general anesthetic.

The patient is now etherized and I shall make the usual S-shaped incision that we employ in exploring the bile tracts. On opening the peritoneal cavity I come down at once to the gall-bladder, about the size of my thumb, packed full of gall-stones, containing no fluid of any kind. It is embedded in adhesions between the gall-bladder and omentum. I separate these with blunt dissection, and in part, as you see, by clamping the firm adhesions at two points and dividing between. With this S incision I obtain an admirable exposure of the operative field. Now, having separated the adhesions, I next attempt to examine the common duct. I find that I cannot introduce my finger into the foramen of Winslow, and that this entire area posteriorly has been obliterated by an adhesive inflammation. As I continue the exposure of the gall-bladder, however, I find that it is apparently an hour-glass-shaped gall-bladder with a contraction near the neck of the gall-bladder, and beyond the contraction an enlargement containing a large stone, which seems to be about  $\frac{3}{4}$  inch or more in diameter. You will notice that I have been standing on the right side of the patient during this part of the

operation. I shall now move to the left side in order to complete the deeper part of the dissection. I want to call your attention particularly to this step in the technic, because we have found that moving to the left side and completing the deep part of the operation from that side has been of very great service and has made it very much easier for us to do complicated cholecystectomies and common duct work. Continuing my dissection and separating the adhesions, I am not able to outline the common duct. I have freed the gall-bladder as fully as I can from the liver, with the exception of what seems like a broad massive adhesion very deeply situated. I do not dare to divide this, however, because I do not know exactly what it is. I think the wise thing and safe thing to do under the circumstances is to split the gall-bladder open and attempt to split the cystic duct open and open the common duct in that way. You see that before opening the gall-bladder I surround the area with pads. I divide first through the main gall-bladder itself, and then this contraction into the second hour-glass pocket containing the large stone which I have described to you. I scoop the stones in the gall-bladder into this spoon-shaped instrument which we employ for the purpose, and I now lift out the large stone in the second pocket beyond the contraction. As I do this you see there is an escape of a large amount of bile. Behind this big stone I pick out, with the forceps, two other stones, and I now find what is a real surprise to me, a very interesting condition: the pocket containing the large stone is not a part of the gall-bladder, but is a tremendously dilated part of the common duct. I now introduce a probe down through the common duct into the duodenum and find no other stones. I also introduce a probe upward into the hepatic duct. I particularly want to call your attention to the fact that as I do this I find that what I thought was possibly a broad adhesion between the gall-bladder and the liver is, in fact, the hepatic duct itself. If I had divided this with the idea that it was an adhesion I should have done irreparable damage to the patient (Fig. 251).

I now examine the pancreas and find that there is no mass in the pancreas and no evidence of carcinoma. I remove the

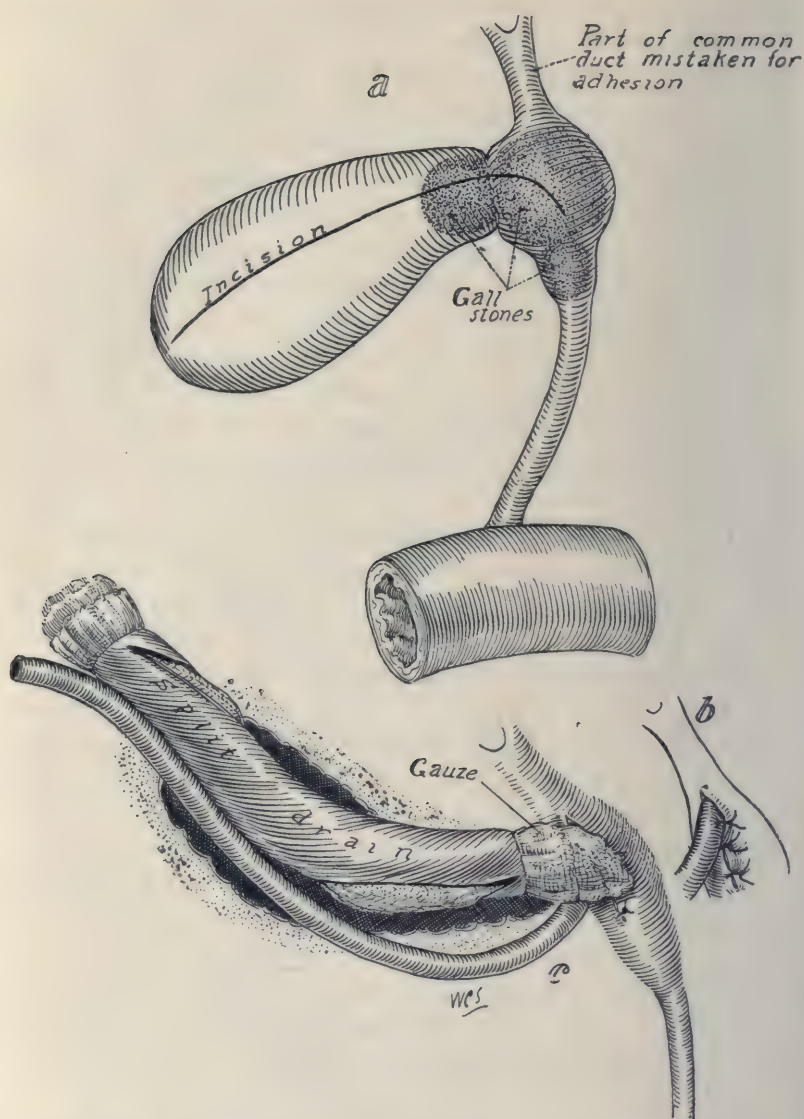


Fig. 251.—Obstruction of common bile-duct: *a*, Apparent hour-glass gall-bladder; *b*, catheter sutured into common duct; *c*, split rubber tube containing gauze placed over site of gall-bladder with end extending to opening in common duct.



gall-bladder, and in doing this have to clamp and ligate the large cystic artery. I now introduce a No. 14 American soft catheter into the hepatic duct for about  $\frac{3}{4}$  inch and sew it into position with a piece of fine catgut. After removal of the gall-bladder I close the large opening in the dilated part of the common duct with three sutures of fine catgut. I am going to leave in contact with the raw surface of the liver from which I have dissected the gall-bladder a split rubber tube containing a piece of iodoform gauze, and leave about an inch of the iodoform gauze covering the opening in the common duct. I have a good deal of confidence that in cases of this kind the iodoform gauze is of value in reducing to a minimum the possibility of infection of the raw surface of the liver from the possibly infected mucus and bile that has undoubtedly come in contact with it during this operation.

This case, to my mind, is most instructive and shows very definitely the considerable risk that surgeons run in handling these complicated bile tract cases, of injury to the hepatic or common ducts. You can see how easily in this case, if I had been in a hurry or if I had not studied these structures with great care, I could have clamped off and ligated off the hepatic duct itself. The case I think should be a lesson to us, showing the great need of wide exposure and careful study of these cases in order to avoid any such serious injury.

**After-history.**—The patient made a very satisfactory recovery. The tube and iodoform gauze were removed on about the fourth day, and this produced considerable distress to the patient, as the iodoform gauze held fairly firmly down deep in the wound. This is undoubtedly an objection and a strong argument not to use gauze in these cases. I think, however, that in infected cases it is a wise thing to use the gauze, and that it is a good plan to reduce the discomfort to a minimum by using a split rubber tube covering the greater part of it. The jaundice rapidly disappeared. The hepatic duct was drained for ten days. One-half of the silkworm-gut stitches were removed on the ninth day and the balance on the twelfth. The patient made a complete and satisfactory operative recovery.



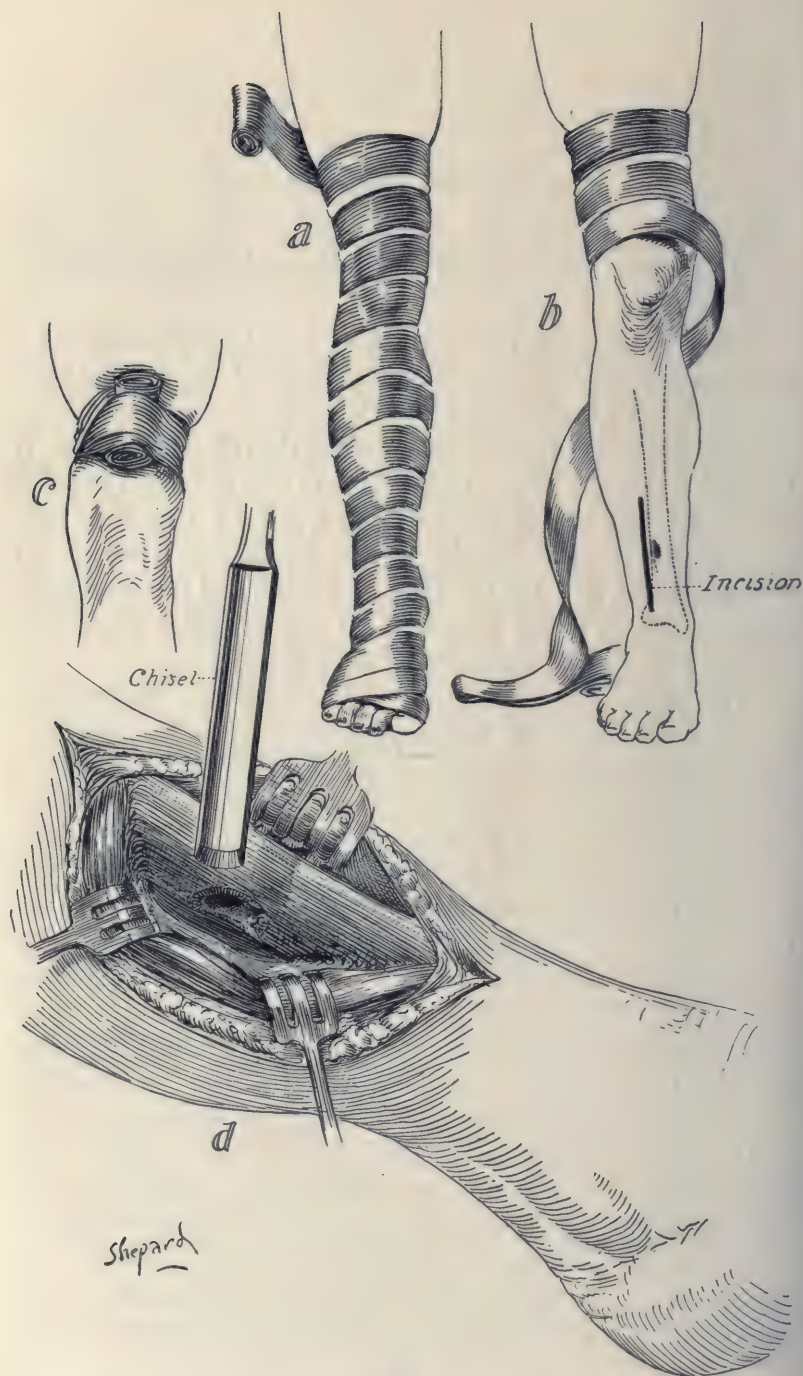
## BRODIE ABSCESS

*Summary:* Clinical history, signs, and diagnosis of Brodie abscess; technic of operation—mechanical cleansing of abscess followed by immediate closure.

I WANT to operate this morning on a patient upon whom we have made a diagnosis of a Brodie abscess. I like to retain the name "Brodie abscess" for a certain group of cases. The term was one which was in more common use thirty years ago than it is today, but it describes a certain type of case which has peculiar clinical findings and in which I have now for a long time been employing a certain definite scheme of surgical therapy. A Brodie abscess, as I use the term, is a small and usually deeply situated abscess in the bone without any extensive fistula and without any extensive osteomyelitis or necrosis.

This patient upon whom we shall operate this morning is a man of forty. When he was seven years of age he had an osteomyelitis of the right tibia and of the right humerus. You will notice a very great deformity of the right arm, the result of a very extensive necrosis of the shaft of the bone, with resulting great shortening. His right humerus is not more than half the length of the normal humerus on the left side. He has, however, fairly good use of his right hand and forearm. The disease in the right tibia was not as extensive, but resulted in an abscess and, later, the throwing off of a number of small sequestra. The leg eventually healed entirely and he has had no further trouble for about thirty-three years. Within the last few months, however, he has been suffering from very intense pain in the leg on the tibial side and about 5 inches above the ankle-joint. This pain is of a boring character and very intense. There has been no swelling of the limb, or if any, very slight swelling, no redness, and no evidence of the development of a superficial abscess or fistula. At a point about 5 inches above the ankle-joint on the tibia he himself points out an exquisitely tender area about the





size of a quarter. The pain is worse at night. Some days he has been fairly free from it and other days the pain has been so intense as to incapacitate him for work. There is no history of syphilis. The Wassermann is negative. An *x*-ray picture shows, at the point of tenderness, a small abscess about  $\frac{1}{2}$  inch in diameter in the shaft of the tibia near the fibular side, and along the posterior surface of the bone. I have made, therefore, in this case a definite diagnosis of a small bone abscess of a type which I believe should be properly called a Brodie abscess.

We have developed in this clinic, since the introduction of the *x*-ray, a definite technic for the handling of these cases that has proved to be very satisfactory. I shall proceed to employ it in this case. The patient is now anesthetized and I shall first apply a Martin elastic bandage from the toes well above the knee-joint in order to make the operation perfectly bloodless (Fig. 252, *a*). I believe that this is a matter of a good deal of importance in doing this operation properly. I now remove the Martin bandage from below the knee and proceed with the operation (Fig. 252, *b*, and *c*). I measure off quite accurately a distance of about  $5\frac{1}{4}$  inches above the ankle-joint as the location of the abscess as shown by the *x*-ray. Inasmuch as the abscess is toward the fibular side and toward the posterior surface of the tibia, I shall make an incision just external to the crest of the tibia about 5 inches in length, the center of which will be opposite the point of the abscess. This divides through the skin and superficial fascia (Fig. 252, *b*). I now come down to the tibialis anticus muscle. I separate this carefully from the tibia and draw it to the fibular side. This allows me to expose the external surface of the tibia fully. There is, as you see, no evidence of any inflammatory process here. The muscles, bone, and periosteum seem to be perfectly normal. I begin now and

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Fig. 252.—Brodie abscess: *a*, *b*, and *c*, Method of applying Martin bandage. In *c* the bandage has been removed from the leg below the knee and the excess roll inserted under the encircling portion, so as to make pressure in the popliteal space. In *b* the location of the abscess, as indicated in the *x*-ray plates, is marked on the lower third of the shaft of the tibia and also the line of the incision for its exposure; *d*, the abscess has been thoroughly gouged out, and the wound is now ready for its final dressing and closure.

chisel away the posterior portion of the inner surface of the tibia 5 inches above the ankle-joint. I do this with a good deal of care so as not to run any risk of fracturing the bone. The first layers of bone that I remove are quite normal, but as I reach a depth of about  $\frac{1}{2}$  inch I come rather suddenly on to a small bony cavity about as large as a cranberry. This contains a few drops of pus, but the cavity is made up mostly of granulation tissue. The walls of the cavity are very dense and hard. There is no piece of necrotic bone. I curet out the granulation tissue. I take a gouge and scrape the walls of the cavity and attempt to clean the cavity out thoroughly, as if this were a cavity in a tooth that I was preparing to fill (Fig. 252, *d*). You will see there is no bleeding. That is entirely controlled by our elastic bandage. The cavity now looks perfectly clean, and I will, however, make some additional effort to sterilize this first with peroxid of hydrogen, which I pour into the cavity and leave there for a few minutes. I mop this out and then I fill the cavity full of 70 per cent. alcohol and leave that for about a minute. I am not perfectly sure that the peroxid of hydrogen and the alcohol add anything to the mechanical preparation, and yet I think it is better to employ them, and we have made their use a part of our regular technic. We now mop out the alcohol, and then before I remove the Martin bandage I make a complete and accurate closure of the wound without any drainage. I have been very careful in the dissection to avoid injury to any vessel of any size, so that I do not think there is a possibility of hemorrhage of any moment. I now put on a rather copious dry dressing and over this a soft roller of gauze, and then, what I think is quite important, a flannel bandage from the toes well above the knee, making moderate pressure over the entire limb, which will control any ordinary bleeding that might occur. The patient will be put to bed and kept at rest for about ten days, and at the end of that time the soft tissues will probably be healed. It will, of course, require another five or six weeks for the repair in the bone to be completed.

We have had an opportunity of employing this technic in a good many cases in the last ten years, and it has given almost



universally satisfactory results from the standpoint that we have in this way been able to remove the infected focus and sterilize the wound so thoroughly that no further infection has occurred. Fortunately, I shall be able to show you this morning a second patient upon whom we did this same operation a few months ago.

This young man is twenty-four years of age. He has been married but a few months and denies any venereal history, and has a negative Wassermann. He has complained for six or eight weeks very bitterly of a very severe pain in his left thigh. He has been seen by a number of medical men. The case has been treated as one of neuritis, as one of sciatica, and as one of rheumatism. The possibilities of syphilis have been carefully considered, and in spite of a negative Wassermann he was put upon antisppecific treatment, without, however, any benefit. When he came to me I had an x-ray picture taken of the leg, and it showed a small Brodie abscess, about the same size as in the case that we have just operated on, on the posterior and outer part of the femur about 6 or 7 inches above the knee-joint. This patient has complained of very intense pain. This pain was so severe that it was only partially relieved by narcotics. We did the same operation for him that I have just shown you, and from the time the man woke up from the ether he has never had another twinge of pain. We found a very similar abscess, a little larger amount of pus, however, and little less granulation tissue than in the case we operated on this morning. In this boy's case we made an immediate closure of the wound and obtained primary union. He has never had any further symptoms.

These cases emphasize the importance, of course, of accurate diagnosis, and I think also of the modern technic that we are now employing. In the old days before the use of the x-ray the diagnosis in these cases was very much more difficult than it is now, and yet Brodie and the surgeons after him made an accurate diagnosis from the clinical picture often and relieved the condition by trephining over the tender area. They insisted on an accurate location of the point of tenderness before operation, and then either with a trephine or chisel cut through the bone at that point to the abscess, which experience had taught

them was responsible for this peculiar clinical picture. For a long time surgeons handled these cases by packing them with gauze and having the wound heal slowly from the bottom by granulation, and they were well satisfied with the result because they cured their patients, but it required a long tedious course of after-treatment. After the introduction of the x-ray, of course, the diagnosis was much more easily made and much more accurately made, and we can determine by a series of pictures the exact location of the abscess and can find it much more readily at the time of operation. Then, too, we learned that after a thorough mechanical removal of all of the infected tissue we could then make an immediate closure and, as a rule, obtain primary wound healing, shortening very greatly the after-management of the case. This, in fact, is exactly the same lesson that has been learned during the war, that if we mechanically remove the infected focus, such as the material in shell wounds, all of the dead and devitalized tissue, foreign bodies, fragments of shell and clothing, that if we accurately remove all of the pieces of foreign bodies that are covered with germs or contain germs, we can then make a primary closure with excellent prospects of having the wound heal by first intention.

**After-history.**—In the first case the stitches were removed at the end of the tenth day. There was a little ecchymosis about the wound and no suppuration whatever. The pain was gone when the patient woke up from the anesthetic and has not returned. I saw the patient again at the end of five weeks and he had made a complete recovery. The limb on that side, however, was somewhat smaller than normal, due, of course, to the atrophy of disuse that had developed somewhat before the operation, and had, of course, continued for several weeks afterward. This, however, is, of course, temporary. The man has made a complete recovery in the sense that he is rid of the suffering and tenderness.

## RODENT ULCER OF FACE

*Summary:* Perforation of the cheek by ulcerating carcinoma; complete removal of lesion and restoration of cheek by suture of mucous membrane and transplantation of skin from the neck.

THE first case that I shall operate on this morning is a man fifty-five years of age, who has had, for five or six years, a rodent ulcer of the left side of his face. This has been very slow growing and has been treated by a number of different methods. When it first began the physician in charge thought of the possibility of its being syphilitic, and he was placed upon anti-specific treatment, apparently with some temporary benefit. At that time the lesion was very small, about the size of the end of one's finger only, and situated about the middle of the cheek on the left side. It was then treated with x-ray for a while, and finally the lesion extended and involved the parotid duct, producing a salivary fistula. The patient was brought to me for the purpose of curing the salivary fistula. This we succeeded in doing by a plastic operation (Clinic on "Salivary Calculi," Surgical Clinics of Chicago, April, 1918). At that time the dermatologist in charge of the case regarded it as one in which the epithelioma had been cured by x-ray treatment. A few months after our successful plastic on the salivary fistula the lesion reappeared as a definite ulcerating epithelioma. It was then treated with x-ray, but without any benefit, and he comes to us now with this large opening in the cheek through which food and saliva pour, producing not only a great disfigurement but also a source of a great deal of annoyance to the patient. On examining all the facts in the case I have decided to remove the epithelioma widely with the knife and then fill in the defect by a plastic operation, taking a pedicled flap from the neck.

The patient is now anesthetized, and going widely of the lesion I dissect out an area irregularly, 3 inches in diameter, including all of the grossly involved tissue and going widely



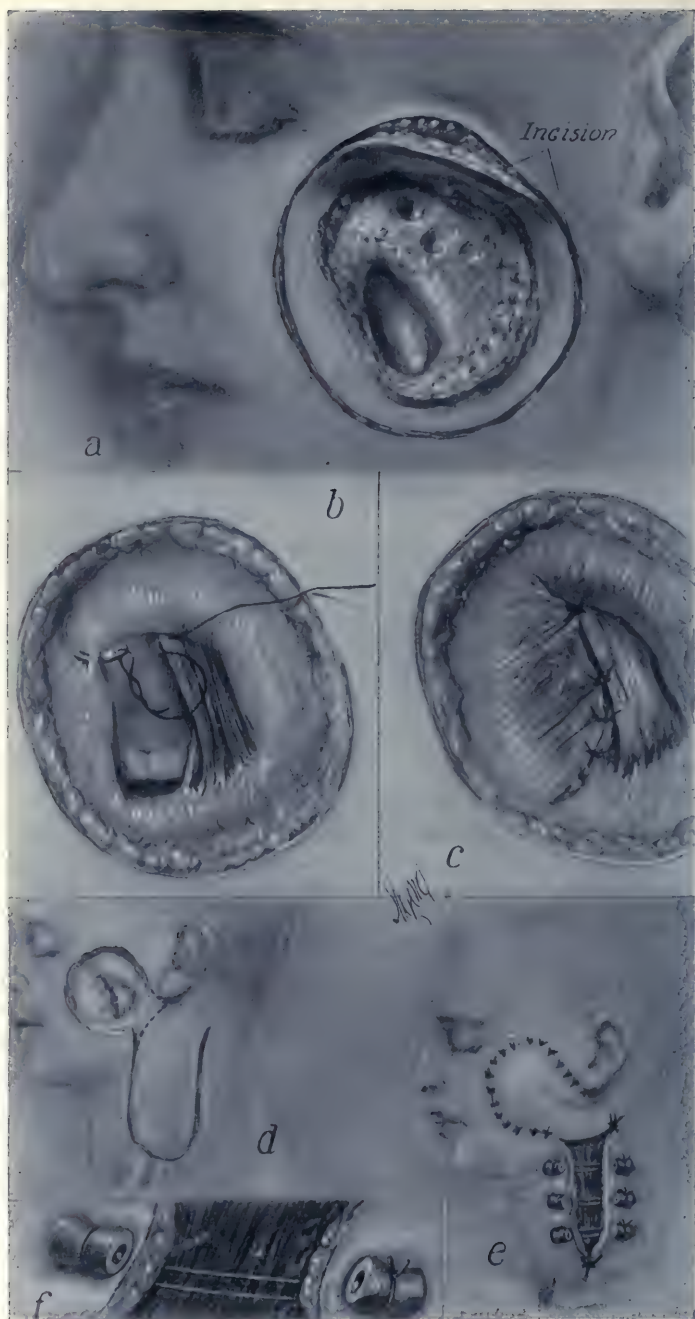




Fig. 254.—Thiersch grafts in neck wound.

into normal tissue (Fig. 253, *a*). The defect in the mucous membrane of the cheek I shall attempt to make as small as possible by sliding the mucosa together (Fig. 253, *b*, *c*) and holding

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Fig. 253.—*a*, Ulcerating carcinoma of cheek, line of incision for its removal; *b* and *c*, suture of mucous membrane and soft tissues of cheek; *d*, *e*, and *f*, cutaneous defect closed by pedicled flap from neck; partial closure of wound in neck by silkworm-gut sutures looped over fragments of rubber tubing.

the edges in position by sutures. I now make a large flap of skin and superficial fascia of the platysma from the side of the neck (Fig. 253, *d*), make a turn of about 90 degrees, and bring the flap into position so as to cover the defect, and stitch it in place with fine black silk sutures. The defect on the side of the neck is, as you see, a very extensive one, and I am not able to bring the edges of the skin together and make a complete closure, but I can make this opening very much smaller by drawing the edges of the incision together with three mattress sutures tied over a small piece of cigarette drain (Fig. 253, *e, f*). I shall later, after the neck wound has granulated nicely, remove the mattress sutures and cover the defect with skin-grafts (Fig. 254).

**After-history.**—The patient made an admirable operative recovery, and at the end of ten days to two weeks, under local anesthesia, we removed two good-sized grafts from the back of the left arm and covered the defect on the neck after I had scraped off the granulations with a curet and sterilized it with peroxid of hydrogen and 50 per cent. alcohol. Fortunately, the two grafts took and complete wound healing occurred in about ten days.

The operative result is excellent, correcting the marked defect, and the result is extremely satisfactory to the patient.

This case carries with it a moral. If five years ago we had proceeded to do a radical removal and skin-grafting or plastic, the prospects of permanent cure would have been very much better, and the operation required would have been a minor one compared with the extensive plastic that was later demanded.



## PILONIDAL CYST

*Summary:* Definition of term—diagnosis—treatment by complete excision.

THE second case I shall operate on this morning is a pilonidal cyst. The term "pilonidal cyst" is one that I learned from my old teacher of surgery, Professor Gunn. I believe that he coined the term, though I am not absolutely sure of that fact. The term means a nest of hair. The location of these pilonidal cysts varies somewhat, and yet, as a rule, they are in the midline, from 2 to 5 inches above the anus, either over the coccyx or the sacrum. In this case there are two very small openings, as you see, about the middle of the sacral area (Fig. 255, *a*). Their origin is congenital. They consist of a bud of epithelium that has been turned under the external integument. This congenital condition is quite common and many individuals go through life without its ever being a source of annoyance. As a rule, however, sooner or later the cyst becomes infected and produces symptoms which demand interference. Very often the condition is incorrectly diagnosed and when the cyst is close to the anus it is thought to be an ischiorectal abscess with an anal fistula resulting. I have seen a number of these cases badly handled because of that mistaken diagnosis. I have seen other cases that have been diagnosed as cases of osteomyelitis of the sacrum. The condition is so easily recognized after one becomes familiar with it that there is little excuse for these errors in diagnosis.

I shall operate upon this patient under local anesthesia. I shall infiltrate pretty well the skin and superficial fascia around this lesion and make a fairly wide incision, including both of these fistulous openings and the superficial fascia down almost to the periosteum of the sacrum. Retracting the edges of the incision I dissect out the superficial fascia widely, being sure that I do not leave any of the cyst wall which I am sure exists in this case (Fig. 255, *b*, *c*). I have now removed an elliptic mass of tissue

including the cyst, and on splitting it open, as I do now, you can see that there is a definite cyst wall containing pus and some hair that looks very much like the hair used by plasterers in making mortar. This is growing from this skin bud located beneath the skin. The sac contains not only the hair but also some sebaceous secretion and some old digested pus.

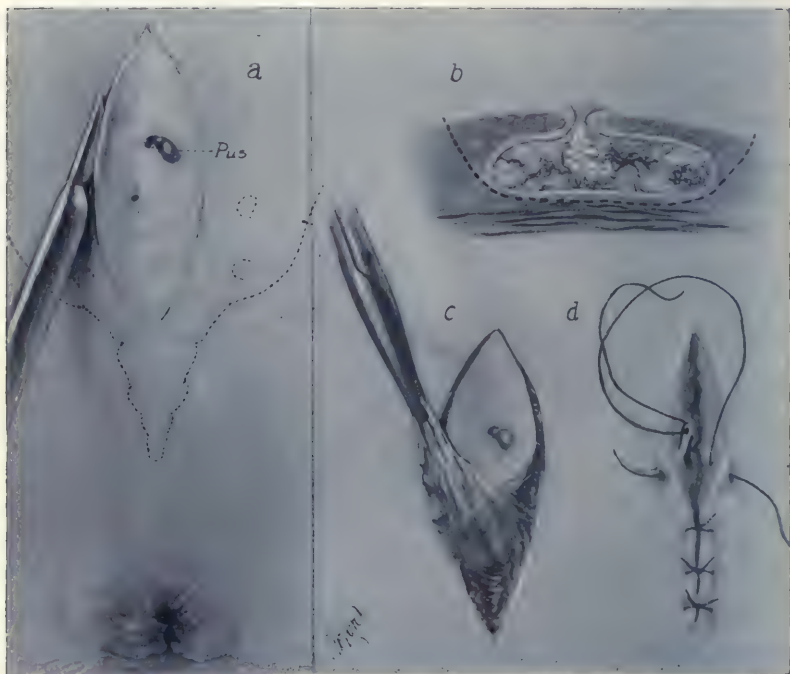


Fig. 255.—Pilonidal cyst: *a*, Cutaneous openings communicating with cyst and incision for its removal; *b* and *c*, removal of cyst with surrounding tissues *en masse*; *d*, closure by interrupted sutures without drainage.

I will now close the incision with black silk sutures without any drainage (Fig. 255, *d*). I want to call your attention to one important point in dressing these cases, that is, the use of stiff oxid of zinc paste covering the line of incision so as to protect it against any possible infection from the anus. I am confident that we have seen on our service 40 or 50 of these pilonidal cysts in the course of a number of years and have become quite

familiar with them. In the majority of these cases the correct diagnosis has not been made and many of them have been improperly handled. The usual method has been scraping the inflamed area and treating it as an abscess without excision of the epithelial sac. This, of course, simply gives temporary relief in the case of an inflamed cyst, but a fistula persists, and unless the pathology is understood the medical attendant is at a loss to know why the suppuration continues. There is but one way of handling them, and that is by complete excision, removing every vestige of the epithelial sac, and also, in long-standing cases of suppuration, all of the surrounding inflammatory tissue, and then obtaining a closure.





## GASTROTOMY ON A BABY FOR THE REMOVAL OF AN OPEN SAFETY-PIN

THE third case I shall operate on this morning is a case that has been referred to us from the Pediatric Department of the Presbyterian Hospital. The history is, briefly, as follows:

This child, who is about fifteen months of age, was left by the mother for a few moments, and on her return she found that the child's mouth was bleeding and the child was choking, but after a few minutes seemed to be all right. The bleeding from the mouth was slight and temporary. The mother became alarmed, however, and on investigating found that a safety-pin which she had left near the child was missing. She at once consulted a physician and an x-ray picture was taken, showing that there was no safety-pin in the esophagus, but that the safety-pin was in the stomach—the first picture showing it a little to the right of the midline directed toward the pyloric end of the stomach. The pediatrician, feeling that it was possible that the pin might pass, has kept the child under observation for some days. Yesterday a second picture was taken, showing that the pin was in the same position. The pin is open, and probably from the evidence which we now have the open safety-pin has caught in the pyloric end of the stomach and there is little possibility of its passing normally, and there is a probability that if allowed to remain it may be the source of grave danger to the child (Fig. 256, *a*). On that account I have advised a gastrotomy and removal of the pin.

The operation is a rather simple one. The technic, however, should be very carefully carried out so as to prevent any risk to the patient. The child is now anesthetized and I make an incision about  $2\frac{1}{2}$  inches long in the midline above the umbilicus and divide the abdominal wall and the peritoneum. I now pick up the greater curvature of the stomach and pull it gently



Fig. 256.



out through the incision. I pull out the lower third of the stomach, and finally, as you see, I bring the duodenum into view. Carefully grasping the duodenum and pylorus, I can distinctly feel the safety-pin. Holding it firmly with my thumb and fingers so as to bring the safety-pin firmly against the anterior wall of the stomach, you see the visible ridge made by the pin (Fig. 256, *b*). I make a small incision through the stomach wall and then seize the round end of the safety-pin, that is the end away from the pin point, in an artery forceps, and gently extract the pin from the stomach, and then close the small incision with three rows of sutures, one through the mucous membrane, one through the peritoneum and muscularis, and finally Lembert sutures invaginating the incision and obtaining a good broad approximation of the peritoneum so as to ensure against leakage (Fig. 256, *c, d, e*).

**After-history.**—I did not hesitate to feed this child six or eight hours after it came out from the anesthetic. I felt confident that my closure of the abdominal wall would secure us against the dangers of leakage, and the little patient went on to an uninterrupted recovery.

It is hardly necessary for me to state that if the safety-pin had been closed we would not have undertaken this operation. A closed safety-pin almost invariably passes through the alimentary canal without any difficulty and with no risk to the patient. The same is true of most smooth bodies, such as pennies, marbles, tin whistles, etc., that are swallowed by children. Any smooth body that can pass through the esophagus into the stomach almost invariably will pass out without any difficulty. It is remarkable that even such an object as an open safety-pin will pass and not be caught and become fixed, but where they are caught and become fixed it is, of course, a safer plan to make a gastrotomy and remove them as we have done in this case.

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Fig. 256.—*a*, Sketch showing abdominal incision and position of safety-pin as indicated by x-ray; *b, c, d, e*, steps in removal of pin and closure of operative wound in stomach.



## TUMOR OF THE URINARY BLADDER

*Summary:* Diagnosis—partial removal by fulguration—later complete excision with electric cautery—defect closed by suture; general statement regarding the management of bladder tumors.

I HAVE a very interesting case to present to you this morning. A man about fifty was sent to us with a history of blood in the urine, and I think we can add bleeding from the bladder, because the blood came in greatest amounts from the bladder and there were no kidney symptoms of any kind. When he came to me he had just been cystoscoped and a bladder tumor found. He was admitted to the service of my colleague, Dr. Herbst, who cystoscoped him again, and found on the back part of the bladder on the right side about an inch above the ureter a tumor about as big as an English walnut. It was very vascular and was covered with a kind of papillomatous fringe which bled very easily. He at once proceeded to fulgurate the tumor. He did this on three different occasions and succeeded in stopping the hemorrhage entirely. I think that was the proper thing to do because the patient's hemoglobin was very low. The hemorrhage stopped; the man's general condition improved; he gained over 20 pounds in weight, and felt very greatly improved from the treatment. However, after burning off by this process of fulguration the fringe-like portion of the tumor Dr. Herbst could see a solid mass back of this that was almost certainly a carcinoma. We talked the matter over together and came to the conclusion that we would resect the tumor by a radical operation.

This morning we shall put the man to sleep, fill the bladder with warm boric solution, and then make a pretty wide suprapubic opening, keeping outside of the peritoneum. When I open the bladder I find this tumor just in the location that Dr. Herbst found it in the cystoscopic examination. I put the man in the Trendelenburg position and make an incision



in the bladder about 3 inches in length, so as to bring the tumor very nicely into view. Then I take the electric cautery and, going fairly wide of the tumor through the normal mucosa, I cut out the tumor, cauterizing very thoroughly the mucosa and muscularis at the base of the tumor; the muscularis seems perfectly free when we remove it. After removing the tumor I have a big raw surface left, which I sew up with fine catgut, sewing up the mucous membrane and muscularis so as not to leave a dead space. Then I sew up the opening in the bladder. That controls the hemorrhage quite completely, so the bladder is perfectly dry. When the man was in the Trendelenburg position in order to prevent any urine leaking out of the wound I simply, two or three times during the operation, packed a small sponge in the bottom of the bladder so as to soak up any urine that might be excreted into the bladder during that period. I close the 3-inch opening with catgut entirely, except a place about as big as my little finger, through which I insert a rubber tube projecting into the bladder for about an inch. I then close the suprapubic wound.

#### COMMENTS

I show this case to you this morning because I really feel that it has been well handled, and that this method should be adopted in these bladder tumors, that is, first, an examination to outline the exact position of the tumor; second, fulguration to control the hemorrhage; third, a thorough excision by the method which I have just described to you. I think the patient will most certainly go on to a good operative recovery; as far as the after-management is concerned, Dr. Herbst and I have agreed that if there is the least evidence of recurrence we shall use either fulguration or radium, so I think we can obtain a good deal of relief for the patient if not a radical cure, although radical cure in carcinoma of the bladder of that size is quite the exception. We are limited a good deal in the size of the block of tissue we can remove. For instance, we cut to within  $\frac{1}{8}$  inch of the right ureter, as near as we dared to the ureter, but not as far from the tumor as we wished, but, of course, it is not desirable to injure

the ureter. It is quite a different proposition from such a condition as carcinoma of the breast, where we can go very widely of the primary lesion and remove a very large block of tissue, or it is quite a different proposition from a carcinoma of the colon, where we can go very widely if we are fortunate enough to make an early diagnosis and find there is not as yet any radical involvement. In these bladder tumors, especially those situated near the ureter, we are limited in the amount of tissue we can remove. It is not desirable to injure the ureter on that side, because if you do, you will have to proceed to do a nephrectomy and trust the patient to get along with one kidney, and good surgical judgment does not very often warrant the addition of that complication to the operation.





## AMEBIC ABSCESS OF THE LIVER

*Summary:* Diagnosis—importance of the x-ray examination; abdominal exploration under novocain; demonstration of the abscess—technic of the surgical treatment—the importance of drainage and the folly of irrigation and antiseptics.

THE first case I shall operate on this morning is a peculiarly interesting one. He is an Italian, about thirty years of age, who has been sick for about two months. He has been handled by some outside medical men, and I am inclined to think their early diagnosis was either pneumonia or pleurisy, and I think they were quite warranted in making that diagnosis. He had a history of an acute infection in the right upper quadrant of the abdomen and of the lower part of the chest on the right side, associated with pain, tenderness, chills, fever, and now—jaundice. We do not find any history of a preceding lesion like an appendicitis. I had Dr. Herrick see the case for me yesterday. He examined his chest and was at first inclined to think of the possibility of an empyema. We had, however, had the man examined with the fluoroscope and an x-ray picture made, which showed some interesting things. First, the lung on the right side is clear. Second, there is a very high stand of the diaphragm on this side. The diaphragm is 2 or 3 inches higher than it should be normally on the right side. In the third place, he has a large, painful swelling in the upper abdomen right under the costal arch that is quite tender on pressure. Now we have to deal most surely with either an abscess of the liver or a subphrenic abscess, but the exact pathology I am not able to state. It seems to me quite clear that the proper thing here is, under local anesthesia, to cut down over this swelling just below the costal arch, and if it is a subphrenic abscess or an abscess of the liver to provide proper drainage.

The patient is now prepared for operation. I think good surgical judgment here would be to use a local anesthetic. The

man has been sick for about two months. The character of the operation we are going to make does not require relaxation. We are simply going to cut down on the abscess and drain it. I think that can be done with a good deal of comfort to the patient under local anesthesia and with more safety than if we employed a general anesthetic.

You will notice that I make a wide wheal with this little fine hypodermic needle. Now I have anesthetized the area between my fingers, the skin and superficial fascia, and I have also, throughout the greater part, perforated the anterior sheath of the rectus, throwing some fluid into the sheath of the rectus. I am now dividing the skin and superficial fascia, and I have divided the anterior sheath of the rectus. I will now infiltrate the rectus pretty thoroughly. Let me call you attention to an interesting thing in these local operations in the abdomen. It is a very interesting and important fact that the parietal peritoneum is very sensitive and the visceral peritoneum has no sensation at all. You can resect a loop of bowel or cut it or tear it without any sensation whatever. The parietal peritoneum, on the other hand, has to be quite definitely anesthetized because it is quite sensitive. This patient's hemoglobin is down to 23 per cent. Now I am dividing the posterior sheath of the peritoneum. You see the pus welling out the minute we cut into the peritoneum. This is pus, with some hemorrhage in it. There is a very large abscess cavity; exploration of it with the hand is just like putting your finger out of an open window, there is no bottom to it at all.

Now I want you to follow this technic. I am not going to wash this abscess out. I am not going to try to force out any pus. I am going to let that pus come out just as it will in the dressings. Any one who would tell me to wash this out or use Carrel-Dakin or any antiseptic would not know the first principles of surgery. It would be a very bad thing to attempt to sterilize this abscess by any mechanical method. It would not do any good. The thing is, to provide drainage with as little trauma as possible. This man will sterilize his own cavity and get well of this abscess by the power of his own juices and not by any chemical that you may introduce into it. I am simply

putting a couple of stitches here. Now that is all there is to be done. We have given the pus a chance to get out; now we will just feed him up and he will get rid of the toxemia produced by the pus under pressure and that enormous cavity will gradually contract. I do not know what the pathology is except that we have a great big abscess. I do not know what the primary focus is, but I do know that the proper thing to do here is simply to provide an exit for that pus. If I were perfectly sure that the wound would stay open without a tube I would leave the tube out. Now, if this man gets well, and I think he is going to get well, this abscess wall will gradually become smaller because the intra-abdominal pressure will force the sides of it together, and then his own power of resistance against this infection, which will consist of antibodies and juices of his own body, will eliminate the infection, just exactly as it does if a man recovers from measles or when he recovers from influenza or from typhoid fever. It is not anything that you do in a case of that kind at all. Suppose a man has a gangrenous empyema, what can you do? The thing to do is to provide drainage with as little trauma as possible. You cannot be of any service whatever by drugs or by antiseptics. That has been shown very definitely and absolutely in this epidemic in spite of the fact that men of limited experience have been enthusiastic about the value of antiseptics in the pleural cavity. In gangrenous empyema with as little trauma as possible you get an exit for the pus. Here, again, if you can get along without a drainage-tube you should do so, but if you must use one, be sure that it is a short tube. You want to provide good drainage, but you never want to irrigate the cavity, you never want to try to wash out all the pus. When you relieve the man of the toxemia from the absorption of pus under pressure he will begin to get better.

As to the possibility in this case—this may be an amebic abscess of the liver. That will be determined by an examination of the pus. It might be a subphrenic after an appendicitis, which has been overlooked. It may be a subphrenic after a duodenal ulcer that has perforated—a subacute or chronic perforation of a duodenal ulcer. I say that because we have



exactly that same condition from these different pictures, from a duodenal ulcer, from an empyema, from an abscess of the liver, or from a subphrenic abscess. Of course, good surgery would not permit us to attempt, at this sitting, to make an extensive examination of this man's abdomen to find out what the cause is. That would not be warranted at all. It would not be good surgery to mop out this pus, or if it was a duodenal perforation to try to handle it in the face of this great abscess. That would be poor surgery and would be absolutely unwarranted. Further examination of the case will show whether it is an amebic abscess or a duodenal ulcer which may later require a gastro-enterostomy, or an appendicitis which will later require removal of the appendix.

*Note.*—Microscopic examination of the fresh pus on a warm stage revealed the presence of numerous actively motile amebas.













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